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This report summarizes the work completed and outlines the plans for future research of an ongoing research program of the department of psychology at Wayne State University. The program is concerned with the identification and description of cross-cultural and developmental differences in the conceptualization and linguistic expression of spatial, temporal, causal, and logical relationships. Several specific areas of concentration within this broad topic have emerged: (1) investigations of cultural, developmental, contextual, and situational factors which influence the connectedness and coherence of spontaneous discourse; (2) developmental and normative investigations of the principles underlying the usage and comprehension of linguistic clause connectors (grammatical conjunctions); and (3) investigations of cross-cultural and developmental differences in the principles underlying the conceptualization and linguistic representation of simple geometric forms and concrete spatial relationships. (WD)

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A STUDY OF LANGUAGE DEVIATIONS AND COGNITIVE PROCESSES

Progress Report No. 3

March 1, 1967

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ABSTRACT

This program of research has been directed toward the identification and description of cross cultural and developmental differences in the conceptualization and linguistic expression of spatial, temporal, causal, and logical relationships.

Within this broad, general frame of reference several area of concentration have emerged:

(1) Investigations of cultural, developmental, contextual, and situational factors which influence the connectedness and coherence of spontaneous discourse.

(2) Developmental and normative investigations of the principles underlying the usage and comprehension of linguistic clauses connectors (i.e., grammatical conjunctions).

(3) Investigations of cross-cultural and developmental differences in the principles underlying the conceptualization and linguistic representation of simple geometric forms and concrete spatial relationships.

As this is an ongoing program of research, currently in progress, this proposal both summarizes our work to date and outlines our plans for future research.

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GENERAL INTRODUCTION

The purpose of the present program is the investigation of the relationship between language and thinking as it is realized in the conceptualization and the linguistic expression of spatial, temporal, causal and logical relationships among objects and events. The study of causal and logical relationships promises to provide insight into the kinds of relationships between events, objects and actions which are conceived of as being efficacious within the thought system of a particular individual or group. The study of spatial and temporal relationships is of interest since it has been held that the way in which individuals and cultures organize space and time may be taken as paradigmatic of the way in which they organize their conceptual thought system in general.

The general theoretical framework within which these studies are conceived is provided by Cassirer, Piaget, Vygotsky, Werner, and Werner and Kaplan.[3] Within this framework, the organization of categories and systems of thought has been widely recognized to be intimately tied to the linguistic means available to individuals and cultures for the formulation, expression, and objectification of their thoughts and experience. (See, for example, Cassirer; Fishman; Sapir; Vygotsky; Werner and Kaplan; Whitehead; Whorf.)

For both Cassirer, and for Werner and Kaplan, anthropological data play a particularly important role. For Werner this anthropological interest follows directly from his assumption (1947, p. 3) of certain "formal parallels" between the developmental sequences observed during ontogenesis, and the developmental sequences which occur in the history of a culture, in general, and in its intellectual history, in particular.

While cross-cultural studies of language and thinking have, traditionally, focussed primarily upon differences across nationally-defined linguistic and cultural boundaries, more recently interest has developed in conceptual and linguistic differences between subcultures and social classes within these boundaries (see, for example, Berstein, Hess, Hymes, Lawton, Segal). Partially owing to the impact of the recent Headstart Program, much of this current research has been

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3. The relevant works of all authors cited in the text are listed in the References at the end of this proposal (see pp.47). Where reference is to general theoretical concepts which permeate the entire body of work of an author, or, where only one work by an author appears in the list of references, no year of publication is given after the author's name in the main text. When reference is to a specific work by an author who is listed more than once in the References, then the year of publication of the relevant work is indicated in the text. When reference in the main text is to specific or substantive content in the reference cited, page references are given.

developmental as well as cross-cultural.

In the present program, we have been primarily interested in (1) the kinds of inferences about underlying thought processes which can be made from an analysis of spontaneous language usage, and (2) experimentally independent tests of the hypotheses derived from our analyses of spontaneous speech. For investigation of these problems, we have developed two techniques for obtaining spontaneous speech samples: 1) the Narrative Discourse Technique, which focusses on the expression of temporal, causal and logical relationships, and 2) the Two Person Communication Game, which focuses on the expression of spatial relationships. These procedures provide information on the way in which relationships are actually expressed by the individual. We have also designed a method which gets at the subject's appreciation or understanding of expression of relationships in a critical, evaluative sense. These different approaches permit a comparison of the way in which different kinds of relationships are expressed and understood by the same individual, and are thus of both theoretical and practical importance.

1. Spontaneous Picture Stories: Narrative Discourses

General Procedures.- The subject is shown a series of picture stories from the WISC Picture Arrangement task in the correct order, and is asked to tell a story about the pictures.

Study 1

Subjects.- Subjects were first and sixth grade students at the Lynch Public School (Detroit) which services a predominantly white, lower working-class neighborhood.

Results.- A mere cursory perusal revealed a marked difference in the quality of the stories told by the Grade 1 and Grade 6 pupils. This difference seemed unrelated to the quantity of verbiage produced; i.e., some younger children produced verbose stories which seemed quite inferior to shorter stories of older children. Furthermore, these qualitative differences did not seem to be a function of the correctness of the simple sentence structures used. (Most Grade 1 subjects used reasonably correct simple sentences in relating their stories.) The critical differences seemed to be with regard to (1) the logical connectives used to relate simple descriptive sentences, (2) the order of the story-elements in the story as a whole, (3) the use (by the younger group) of syntactically correct but semantically vague pronouns, and, contrastingly, (4) the over-explicit use of nouns where pronouns would do just as well.

Although originally intended merely as a means of eliciting speech which employed particular types of connectives, these stories seemed to be so rich a source of general linguistic and conceptual data, that the detailed analysis of the stories themselves has become a major focus of our investigation. In attempting to specify the nature of the differences between the Grade 1 and Grade 6 stories, we have developed a method of analyzing stories according to structural, semantic and integrative features. (See Appendix A.)

Study 2

Subjects.- Subjects in this study were 39 children, 4 - 6 years old, enrolled in a summer Headstart program at the Lynch School, and drawn from the same neighborhood as those in Study 1.

Procedural modifications.- Analysis of Study 1 indicated that the Grade 1 subjects used a great deal of implicit depiction, i.e., the use of demonstratives and pronouns to refer to people in the pictures. The referents of these demonstratives was clear as long as the subject could point to the object meant. The question arose, however, what the subject would do if the pictures were removed, i.e., would he be capable of using a linguistically complete formulation--one which did not require support from gestures for its interpretation? In Study 2, therefore, after each subject told his initial story, the pictures were removed and he was asked to tell the same story again, without the pictures. These stories were then analyzed by the method described above.

To determine whether a subject was making explicit the referent of the vague demonstratives and pronouns, we added an attachment with which the examiner could put a marker on the tape when the subject actually pointed to an object in the picture.

Results.- A comparison of the stories with and without the pictures showed that in many respects the stories told without the pictures were superior to those told in the presence of the pictures: e.g., there was a dramatic improvement in the quality of language used to relate the stories; a greater connectedness of the ideas which produced the stories; and a marked increase in the amount of spontaneous, logically related speech produced without prompting.

Discussion.- The fact that the stories told from free recall were both linguistically and logically at a much higher level of development than those which were told in the presence of the stimulus materials has interesting implications, both theoretically and practically.

Theoretically, this finding implies that at lower levels of development, under certain circumstances, the presence of a concrete stimulus may actually interfere with the development of linguistically adequate, logically coherent thought articulation. One may speculate that the actual presence of the pictures, which constitute a spatially distributed series of perceptually discrete events, may in fact interfere with our younger subjects' ability to form a temporally distributed and logically continuous story--a task which requires a conceptual and linguistic "bridging-the-gap" between discrete frames. (Some recent findings of Schnall provide corroborative evidence for this line-of-reasoning.) Thus , our youngest subjects exhibit a high degree of "nominalization"-- i.e., much of their verbalization with pictures present consists of simply "naming" the various details in each picture. When the pictures are removed, however, the interfering effects of the picture frames themselves may also be removed, leaving the subject free to integrate, into a more continuous story, those aspects of the original content he is able to recall. In this respect, it is interesting to note that the recall stories frequently include appropriate content not mentioned in the presence of the pictures themselves.

Practically, the pedagogical implications of this tentative finding seem to us quite dramatic. Whereas it has always been assumed that the development of higher level abstract logical thought must be formally grounded in concrete perceptual experience (hence, the heavily illustrated first grade readers, and introduction of concrete materials into mathematics classes), our findings suggest that the continual presence of such concrete representations, may, in fact, actually interfere with the development of higher level, logical forms of linguistic relatedness. It would seem, therefore, that the possibilities for developing some optimal level of interplay between referent-present and referent-absent situations must be investigated.

Current Study

On the basis of these initial studies, we arrived at a set of standard procedures for collecting and analyzing these data, and have undertaken a "parametric" study of developmental, cultural, and social class differences in the connectiveness and coherence of narrative discourse, both with and without the presence of the pictures. This study, which is currently in progress, involves the testing of lower and middle-class Negroes and whites at ages 4, 7, 9, 12, 16 and 20 years of age. These same groups are also being given a number of our other tasks (described below). Several of these groups have already been tested, others will be tested during the coming year.

2. The Conceptualization and the Linguistic Expression of Temporal, Causal, and Logical Relationships: A Developmental Study

The connectedness and coherence of spontaneous discourse is both influenced by and reflects the subject's conceptualization of temporal, causal, and logical relationships, and the linguistic means available to him for expressing these concepts. Linguistically, These relationships are, of course, expressed primarily

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by adverbial clause constructions, i.e., through the use of the "logical" connectives--i.e., the coordinating and subordinating conjunctions.

Although a number of developmental studies of the use of logical connectives are available, the issue with regard to general developmental trends in their use seems today as confused as ever (compare, for example, Heider and Heider; Hunt; Huth; Minkus; Minkus and Stern; Piaget; Stern and Stern; and Vygotsky). The difficulty in interpreting and generalizing these results seems to stem from four sources:

(a) Methodological differences between studies.- Some of these studies were based upon speech samples (Piaget; Huth; and Stern and Stern), others were based upon written language samples (Heider and Heider; and Hunt), and still others, on sentence completion tasks, both oral (Piaget) and written (Minkus and Stern). Since there are marked differences in the formal structure of spoken and written language, the results of studies employing these two different methods are difficult to compare. In addition, the age level of the subjects tested ranges from less than 2 years old, in some studies, to twelfth grade students, in others. In no one study, however, is the entire range investigated in any systematic manner.

(b) Ambiguity in the criteria for "acquisition" of a linguistic usage.- These studies have been primarily interested in the age at which children "acquire" the use of different types of connectives. Owing to the variety of testing methods used, however, the criteria for a child's having acquired a particular connective varies from study to study. Only Vygotsky, in his discussion of Piaget's data, attempts to systematically distinguish between different levels or "ways" in which a child can be said to have acquired a particular linguistic form. Vygotsky refers to these levels, which play a central role in his theoretical interpretations, as the "spontaneous" and the "deliberative" usage of the connective. While the definition of "spontaneous" usage is quite clear, the concept of "deliberative" usage seems to refer particularly to the child's performance on Piaget's oral sentence-completion task. In this task the experimenter supplies the initial clause, and the connector--e.g., The boy fell off the bicycle because...the child must then "complete" the sentence. Data collected by this method is, however, itself very difficult to interpret, as the basis upon which the child selects his response is not at all clear. (This problem is discussed in somewhat greater detail below.)

(c) Structural differences between languages.- In German, for example, there are two distinct linguistic forms for each logical, temporal, causal and comparative connective. One member of each pair requires a subordinate clause construction, the other a coordinate construction. For those connectives which require the subordinate construction, subordination is represented, not only by the presence of the connective (as in English), but, in addition, by an inversion of the word-order in the subordinate clause. Such language-specific characteristics make the formulation of general developmental trends, independent of the specific language used, extremely difficult. This difficulty is particularly relevant to Werner and Kaplan (pp. 170-183) who, in their systematic attempt to deal with the acquisition of connectives in general theoretical terms, rely very heavily on German sources.

(d) Ambiguity of the "linguistic" terminology used.- The principle difficulty here seems to be the lack of an adequate formal definition for the following pairs of terms: dependent-vs.-independent clauses, coordinating-vs.-subordinating conjunctions, coordinate-vs.-subordinate sentence structures, and paratactic-vs.-hypotactic relationships between clauses. A search of the linguistics literature revealed precisely the same confusions among linguists as among psychologists (see, for example, Hunt; Entwhistle; Curme and Kurath). Here, we frequently encounter the same author employing the same term to make one distinction in one context, and the reverse distinction in yet another context; and different authors applying different terms to the "same" linguistic forms.

In summary, then, neither the psychological nor the linguistics literature seems to contain any general formal definitions of these critical pairs of terms--definitions which are both exhaustive of all of the phenomena which they are intended to subsume, and mutually exclusive of each other.

Our Own Approach

At the theoretical level, our own approach has been directed, in part, toward a clarification of some of these ambiguities.

(a) Levels of "understanding" a linguistic usage.- In our own approach we have been interested not only in the age at which a child "acquires" or "exhibits" the external form of a particular connective, but, in addition, we have been particularly concerned with the level at which he "knows" or "understands" the use of that connective. As a preliminary approach to an understanding of these levels of knowing, we currently recognize three distinct levels at which an individual can be said to "understand" a particular linguistic usage or form:

(i) He can *use* it correctly in spontaneous speech. (*understanding*$_1$)

(ii) He can *recognize* a correct from an incorrect usage in language of others. (*understanding*$_2$)

(iii) He can *explain* a linguistic rule underlying that usage. (*understanding*$_3$)

In our own investigation we have employed a distinct method for studying each of these levels.

(b) *Levels of relatedness between clauses within a sentence*.- The nexus of the ambiguity in the classical terminology used to describe the clause connectors and their corresponding sentence structures seems to us to reside, in part, in the failure to systematically distinguish between at least three levels upon which the relationship between clauses can be analyzed.

(i) The level of *phenomenological experience* of the speaker or listener vis-a-vis the actual events being described in the clauses.

(ii) The level of the *syntactic rules* of the language which determine what kinds of linguistic relationships between clauses are and are not acceptable.

(iii) The level of *formal logical relationships* between the clauses treated as propositional arguments, and the clause connectors treated as logical operators.

Sledd has provided a series of illustrations which clearly show the lack of any *necessary* correspondence between these levels. Hence, a complete characterization of the relationships between clauses must take all of these levels into account.

2a. *Cross-Cultural and Developmental Studies*[4]

In our early reviews of the experimental literature, we were particularly struck by the dearth of relevant research on English speaking children. The early studies in the present series were, therefore, undertaken in an attempt to determine the validity for English speaking children of certain hypotheses of Piaget, Vygotsky, and Werner and Kaplan derived from studies fo French, Russian, and German speaking children, respectively.

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4. The material outlined in this section is discussed in greater detail in a paper currently in preparation. This paper appears as Appendix to this proposal.

General Method

These studies were designed to obtain three types of data: (a) spontaneous usage, (b) recognition or preference, and (c) explanation.

Data on spontaneous usage was obtained from two sources: first, from the subject's spontaneous picture stories, and, second, from a "free" dialogue between subject and experimenter which preceded and followed each test session.

In order to obtain recognition data, we designed a Sentence Choice Test (SCT) which consisted of pairs of "similar" two-clause sentences, which differed in the kind of relationship which existed between their clauses. Relationships between clauses were varied in one of four ways:

Type I: Clauses the same, connector the same, but relationship of clauses to connector is reversed.

Example: The boy fell off his bicycle, because he broke his leg.
The boy broke his leg, because he fell off his bicycle.

Type II: Clauses the same, connector varied.

Example: When it started to rain, we ran into the house.
Because it started to rain, we ran into the house.

Type III. Clauses the same, no connector, temporal order of clauses is reversed.

Example: We did not sit down; the benches were wet.
The benches were wet; we did not sit down.

Type IV: Clauses varied, connector the same.

Example: The meal was good, but the pie was bad.
The meal was good, but the pie was good.

Two matched forms of the SCT were made. Matched pairs of sentences in the two forms were identical in syntactic structure, but differed in their particular content. In addition, the order of presentation of choices within each pair, and the order of presentation of the pairs themselves was reversed in the two forms of the test in order to counter-balance for whatever sequence effects there might have been.

The form of the test originally used contained only 9 pairs of sentences. On the basis of our early studies, however, a revised and expanded 15-pair form was constructed, which permitted a more thorough investigation of certain kinds of comparisons which were omitted from the original test. In particular, in this new form, we included examples of the three types of causal explanation--mechanical, motivational, and logical--postulated by Piaget.

The task for the subject was, first, to indicate which member of each pair of sentences"sounded best"or "sounded like the right way to say it" by repeating his choice back to the experimenter, and, second, he was to explain his choice. The entire procedure was tape-recorded; analyses are based on typed transcripts of these tapes.

Studies Completed or in Progress

Data for five studies have been collected. Unless otherwise indicated, the general procedure described above is essentially the same in all cases.

Study 1.- Lynch Public School Grade I (N=21) and VI (N=22) were tested individually, while a College control group was given a paper and pencil form of the same test. Original test form used. (See Appendix C.)

Study 2.- Lynch School Headstart pupils (N=39) were tested individually. Original test form was used.

Study 3.- New groups of Lynch School Grade I (N=20) and Grade VI (N=20) pupils were matched with Grade I (N=20) and VI (N=20) pupils from the Courville School. The former is a predominantly wite school; the latter, predominantly Negro. Both are of the same socio-economic class. A new College control group was used here. Revised test form was used.

Study 4.- A group of adolescent trainees in the Mayor's Youth Development Program-O.E.O. (N=200) were compared with yet another College control group (N=60) in a paper and pencil form of the revised test. The trainees were primarily, although not exclusively, Negro.

Study 5.- A group of trainees in the Neighborhood Youth Corps (N=38) were compared with a College control group (N=25). Both groups were individually tested on the revised test form.

Preliminary Results

Only the data of Studies 1 and 2 have thus far been subjected to an in depth analysis. The results of these analyses, however, are of importance both methodologically and theoretically. Only the most important and interesting of these results are summarized here.

(1) A method of "error" analysis.- Perhaps our single most important result, in terms of the long term goals of this project, was the discovery of a method of error analysis which we believe will provide an insight into the laws of the acquisition of connectives, in much the same way that error analysis has provided an understanding of how children learn other aspects of language: e.g., generalization from regular to irregular verbs, etc. (cf. Berko and Brown).

In the Headstart study (Study 2, above), some of the children spontaneously "repeated" the sentences of their choice. In so doing, they often markedly altered the conjunction which had been read to them--substituting or adding new conjunctions, or omitting a conjunction altogether. Analysis of these spontaneous alterations has provided a basis for understanding what the child is actually doing in making his choice. For example, in choosing between *Jimmie went to school, but he felt fine* and *Jimmie went to school, but he felt sick*, we noted that many of the children who had been scored as endorsing the first (and erroneous) sentence, were not endorsing this sentence at all, but were, rather, endorsing sentences such as *Jimmie went to school* and *he felt fine*, *Jimmie went to school* because *he felt fine*, etc. as indicated by the sentences with which they responded. Thus, these children were, in fact, responding far more reasonably than we would have given them credit for had we assumed they were endorsing the incorrect sentence actually read to them. Quite by accident, then, we discovered that we had an excellent method for studying the actual process of acquisition of connectives. Therefore, in subsequent studies, we have required all our Ss to say the sentence of their choice. Although these results are not yet completely analyzed, there appears to be a great deal of alteration of conjunctions even among the older Grade VI subjects.

(2) Age of acquisition of causal connectives.- Piaget attributes a stage of precausal reasoning to children up to 7-8 years of age, and describes, as one characteristic of this stage, the use of juxtaposition (the stringing of prepositions together without any sort of verbal expression denoting a relation between them). Piaget regarded juxtaposition as being responsible for children randomly interchanging cause and effect statements. In our 6-7 year old children we have found no evidence of this kind of precausal reasoning. For example, given a choice between the following pairs of sentences:

> *We did not sit down, the benches were wet.*
> *We did not sit down, because the benches were wet.*

Our Grade I children rejected juxtaposition (no connective) in favor of using the conjunction "because" to link two clauses.

Or, again, given a choice between these sentences:

> *The boy fell off his bicycle, because he broke his leg.*
> *The boy fell off his bicycle, and he broke his leg.*

Our Grade I children rejected the sentence in which the causal relations were reversed so that the effect was made to appear to be the cause. In both cases these Grade I children behaved in the same way as Grade VI children and College subjects. Although we did not note juxtaposition and clause inversion in our Headstart subjects (age 4-5), these were linguistically deficient children. It may be that Piaget's hypothesis is valid for much younger children, (i.e., children age 2-3) who are in the first stages of using connectives.

Our finding that children by age 6 can handle "because" well, both in spontaneous speech and in a sentence choice situation, is also interesting in view of a rather prevalent notion that so-called difficult semantic patterns, such as "why" and "because", are not mastered until beyond age 6 (Ervin and Miller).

(3) Elliptical constructions.- In discussing the discrepancy between the use of conjunctions in "spontaneous" and in "deliberative" speech, Vygotsky claims that, although a 9-year old child would never produce a sentence like *The boy fell and broke his leg because he was taken to the hospital* in his spontaneous speech, he does, in fact, produce exactly this kind of sentence on Piaget's sentence completion task. Vygotsky regards this sentence as peculiar because of an inversion of the cause and effect clauses. This sentence could, however, be considered an elliptical form of *(I know that) the boy fell and broke his leg because he was taken to the hospital.* Elliptical sentences such as these occurred frequently in the spontaneous speech samples of our grade school subjects. The following example from the record of a Grade VI subject is typical; *It was cold that day because I was marching in the girl-scout parade.*

Instances of "because" preceding effect clauses probably occur frequently, even in adult speech. In inferential reasoning, in particular, the term "because" always precedes the statement of some observable effect which provides the basis for the inference: e.g., *(I infer that) it rained last night, because the roads are covered with water.* Our analysis suggests that this type of elliptical statement is developmentally linked, as Piaget suggests. Piaget, however, regarded ellipses as a linguistically primitive form whereas we found it to be a more mature form, i.e., elliptical forms were much more common among our Grade VI than our Grade I Ss. This finding of more complete structures in younger children fits nicely with results we noted in the story analyses, i.e., that the Grade I children tended to be "over complete" in much of their speech, e.g., in repeating parts of speech which were "understood" and therefore omitted by the Grade VI children.

(4) The problem of "conscious awareness".- Although our Grade VI children, in their spontaneous speech, used elliptical sentences with "because", (where the effect appeared to be the cause), in

the sentence choice test they rejected such a statement. This finding appears contrary to Vygotsky's observation that the discrepancy between spontaneous and deliberate speech favored the spontaneous speech, in terms of level of linguistic sophistication.

The fact that we found the level of expression to be higher in the sentence-choice test than in spontaneous speech suggests that the sentence-completion method used by Piaget and Vygotsky is fundamentally different from our sentence-choice method. Upon analysis, these two methods do appear to involve quite different processes on the part of the child. Our sentence-choice task is structured so that the child has to make a selection on the basis of a critical appraisal of two sentences. By having essentially the same content in both sentences our method focusses attention on the structure, and is therefore an analytic task. The sentence-completion task, on the other hand, resembles spontaneous speech in the sense that the child is asked to produce a language sample of his own choosing, (within the constraints imposed by what is given), and therefore his attention is focussed on content rather than on structure.

Plans for Future Investigations

The studies reported above have raised questions and provided methods for further investigations which are outlined below. These fall into two general classes: those concerned with the relationship between the awareness of linguistic rules and the understanding of logical relationships, and those concerned with the interaction between form and content in determining preferences among complex sentence forms.

3. The Awareness of Linguistic Rules and the Understanding of Logical Relationships

These studies are concerned with the relationship between linguistic forms and logical reasoning.

Background

There has been considerable controversy over the part that language plays in logical reasoning. Some of the disagreement seems due to asking unanswerable questions cuch as "does language aid thinking"? We feel that a more fruitful approach is represented by questions of the following form: "To what extent and for what kinds of thought processes is the ability to verbalize reasoning, rules, etc. an asset, and for what processes is it not an asset, and possibly a liability? Or, again, "What role, if any, does the child's ability to verbalize rules for the use of a particular linguistic form play in his ability to understand the logical relationship implicit in the use of that form?" It is quite clear that the ability to give a formal rule of usage does not, in itself, necessarily imply comprehension of the underlying logical form. For example, although many of our Grade VI children, in giving the explanation of their choice of certain of the sentences, stated that they had been taught by their grammar teacher never to begin a sentence with "because", none could recall any reason for this rule. This rule cannot be considered meaningful to these children, any more than can the rule recalled by some of our colleagues: "a subordinate clause is one which cannot stand alone". While such an utterance is an "expression of a rule", there is no reason to think that ability to make this statement, per se should in any meaningful way be related to ability to produce in language, or understand in thought, dependent relationships among events, any more than production of a memorized formula in mathematics would be expected to contribute to mathematical understanding. In fact, it is conceivable that this kind of meaningless memorization of rules may actually interfere with ability to think.

Our results show that understanding of adversative connectives in the sense of choosing the correct form on the sentence choice task (understanding$_2$) does not depend on ability to verbalize the rule underlying the correct use (understanding$_3$).[5] On the other hand we noted no case in which understanding$_3$ was associated with absence of understanding$_2$. Understanding$_3$, therefore, would appear to be a sufficient but not a necessary condition for understanding$_2$. Understanding$_1$ (correct usage in spontaneous speech), however, is neither a necessary nor a sufficient condition for understanding$_2$, e.g., Grade VI children in our study who used "but" correctly in spontaneous speech were just as likely to choose the incorrect sentence as the correct one in the sentence choice situation. This is an indication of the extent to which usage of language can be unconscious, as Vygotsky correctly noted.

It has been pointed out (Carroll, 1964) that many people never become aware of the classes of experience which they express in language, and that many of the concepts of grammar are learned without the learner's being aware of them. Carroll states that it would seem to be just at this point -- i.e., at the level of grammatical construction -- that language structure could begin to be of real help as an aid to thinking. Carroll notes that statements like *The faster I ran, the better I felt* (P. 92) express the complicated idea of correlation, which college students often find difficult to grasp. These same students were helped in grasping this concept by referring to this linguistic construction and its meaning. The implication is that bringing into conscious awareness complex relations already being expressed in spontaneous language may lead to the understanding of these relations on an abstract level.

Specific Problems and General Approach

The specific problems to be investigated fall into three groups: those concerned with the general relationship between linguistic and logical rules, those concerned with the linguistic expression of conditional and hypothetical relationships (if...then...), and those concerned with developmental trends in the expression of causal relationships.

(1) Linguistic rules and logical reasoning.- We plan to pursue this aspect of our research in two stages:

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[5] Cf. Our three levels of "understanding" a linguistic usage, p. "Understanding Linguistic Connectives".

Our first attempt will be to determine the extent to which our helping a child to become consciously aware of the grammatical structures already existing in his speech will facilitate his ability to consciously control his language. In order to determine ways of helping the child to acquire rules which are meaningful to him, we plan to have the child himself attempt to explain his own usage at the time he spontaneously uses a connective. In so doing, we are assuming that such rules will be more meaningful to the child (a) if they are verbalized in connection with sentences which he himself has produced, and (b) if he is able to figure out the rule for himself. We will then attempt to determine the effect which this method of "instruction" has upon his ability to select the correct form of conjunction on our sentence-choice test.

Secondly, we are interested in whether bringing into conscious awareness complex relations expressed in the spontaneous language of the child, can facilitate an understanding of these relationships on an abstract (purely logical) level. Here we will be comparing the understanding and expression of systems of relationships in two different languages: one, the language of everyday English; the other, the abstract language of logic and mathematics. The general method will be to present sets of complex relations in concrete and abstract language. For example, with regard to transtitive relations, the concrete expression of such a relationship might take the following form: *There are three boys; Jack, Bob, and Tom. If Jack is taler than Bob, and Bob is taller than Tom, which of the following statements is true? (a) Tom is taller than Jack. (b) Jack is taller than Tom*...etc. At the abstract level of expression, on the other hand, a symbol for a general argument (in the mathematical sense) will be substituted for the name of each particular object or event. Thus, the abstract equivalent of the foregoing concrete statement might take on the following form: *There are three things: A, B, and C. If A is larger than B, and B is larger than C, then which of the following statements is true: (a) A is larger than C. (b) C is larger than A*...etc. Sentences of this type represent our broad general approach. Details of method and procedure will be adapted to the particular subject groups being tested and the particular thought-forms being investigated.

It is important to note that in undertaking these studies we are not particularly interested in the relationship between the categories of formal symbolic logic and those of everyday speech. We are, rather, interested in the effect of instruction in one language (e.g., the concrete) on ability to understand the relationships expressed in the other (e.g., the abstract).

At this point it is not known whether, or under what conditions, concrete content functions as an aid or as an obstacle to an understanding of abstract relationships. We know that under some conditions, concrete content can interfere with abstract understanding. One factor which contributed substantially to the difficulty which both Grade I and Grade VI children had in selecting the correct sentence where adversative relationships were involved was the extent to which the content in the correct sentence ran counter to the "value system" of the S. For example, many Ss stated that they preferred *The meal was good but the pie was good* to *The meal was good but the pie was bad* because they "liked" pie. To the extent that affective factors can interfere with logical thinking, it may be preferable to ground certain relations in abstract terms until their implications are fully grasped. Investigation of conditions under which a concrete or an abstract approach, or some combination would most be effective is directly related to our study of the interaction of concrete (with pictures) and abstract (without pictures) approaches to linguistic competence in story telling, (see pp. , above).

(2) Hypothetical and conditional relationships.- Hunt noted that, while the use of "when" decreases sharply from 4th to 8th grade, the use of "if" increases markedly in 12th grade. He speculated that this shift in linguistic usage may reflect a cognitive shift from a time-oriented conceptualization of events, to a logical mode of thinking. The investigation of the "if-then" construction is particularly interesting in view of the child's apparent difficulty in assuming hypothetical and counterfactual positions (see, for example, Feffer; Piaget; Stern and Stern; and Werner and Kaplan, 1952). This apparent difficulty poses an interesting paradox: viz., how can the young child's great facility at pretending--e.g., at assuming various social roles, animal forms, etc.--be reconciled with his purported inability to be "hypothetical". The difficulty here seems to involve not only the empirical data, but the underlying theoretical conceptualization and systematic significance of terms such as "hypothetical", "conditional", "pretend", etc. One question which interests us is this: Under what conditions is it reasonable to assume the child's ability to entertain hypothetical formulations, and under what conditions is this unreasonable? To answer this question, an analysis of the relationship between language, thinking, and concrete action is called for.

(3) The expression of causal connectedness.- The developmental literature appears to present contradictory views with regard to the nature and significance of developmental trends in the explicit use of the connector "because". On the one hand, Piaget, Vygotsky, and Werner and Kaplan, regard the explicit use of "because" as a sign of increasing mental maturity. On the other hand, Hunt found that the use of this connective does not increase between Grade VI and Grade XII, and the Heiders found the explicit use of "because" to be higher in linguistically deficient (deaf) adolescents, than in normals (cf., p. , above). Much of the confusion here, as elsewhere in this general area, seems to stem from a failure to differentiate the kinds of events which are related by this causal connective at different age levels. While Piaget performed a considerable service in attempting to distinguish between mechanical, motivational, and logical types of causal relationships, we have experienced some difficulty in attempting to systematically apply these categories to the spontaneous speech of our subjects. We are therefore attempting to develop a more adequate system for identifying the content-basis of developmental trends in the use of this form.

The foregoing problems focus upon the linguistic context in which the connective "because" occurs. Oakes has noted that the type of causal explanation given (in Piaget's terms) is also highly dependent upon the situational context in which the statement occurs. He found, for example, that children gave mechanical causal explanations far more frequently in response to concrete experimental demonstrations than in response to verbal questions about the same phenomena. Both our Grade I and Grade VI children, in their spontaneous Picture Stories, showed a relatively high incidence of motivational types of causal explanation. Our hypothesis is that this is due, in part, at least, to the fact that these pictures primarily involved people in action. To test this hypothesis, we plan, in our future studies, to design picture series which lend themselves equally well to mechanical, motivational, or logical modes of explanation.

Finally, we have been particularly struck by the importance of investigating the use of linguistic forms which imply the existence of a "causal relationship", without the explicit use of the term "because". Thus, we have been concerned with analyzing alternative modes of expressing causal relatedness: e.g., "to start" as in *He started the fire* which clearly imples *He caused the fire to start;* or "to make" as in *He made me spillmy milk.* While we do not mean, at this stage, to imply that these alternative forms of expression represent identical underlying conceptual schema, we do raise the question as to exactly what the developmental relationship between these forms might be. Are these other forms, for example, developmental precursors to the conjunctive form?

4. The Interaction of Form and Content in Determining Preferences Among Complex Sentence Forms: A Normative Study

In both the psychological and the linguistics literature on "logical connectives" (or "conjunctions"), it seems to have been tacitly assumed that these "function words" are similar to the "logical operators" of the propositional calculus in that they have fixed functional values which determine, but are not determined by, the content which they relate. Certain of our own data, however, have led us to believe that the converse is equally as valid: viz., that the kinds of relationship which the listener already believes possible or probable between a pair of referents will, in part, determine (1) the kind of grammatical conjunction which he will find most acceptable for a particular content, and (2) the kind of relationship between referents which he understands a particular conjunction to convey.

In constructing pairs of sentences for the Sentence Choice Test (supra), for example, we were continually impressed by the subtlety and complexity of the types of linguistic and psychological distinctions which influenced our preference for one form of sentence construction (and conjunction) over another. Similarly, the results of the Sentence Choice Test seemed to indicate that for certain items and certain groups of subjects preference between alternative constructions varied markedly as a function of the particular type of content referred to by the constituent clauses of the sentences.

It seems to be widely assumed that the conjunction, "and", for example, merely conveys the "coexistence" of two referents with no implication of either phenomenological, syntactic, or logical subordinations. To the extent that this is true, reversing the clauses around the connective "and" should produce a semantically equivalent sentence, e.g.:

1a) *This figure has three sides and it is red.*
1b) *This figure is red and it has three sides.*

That such equivalence is not necessarily the case, however, is illustrated by this next pair:

2a) *This boy fell off his bicycle and he broke his leg.*
2b) *This boy broke his leg and he fell off his bicycle.*

Thus, while in the first pair the conjunction clearly serves a coordinating function, in the second pair it serves a subordinating function. In particular, Ex. 2a is semantically equivalent to something like *The boy fell off his bicycle, and then he broke his leg* or *When the boy fell off his bicycle, he broke his leg.* In either case, what is implied is "falling off the bicycle" was the occasion for "breaking his leg". On the other hand, Ex. 2b seems semantically equivalent to something like *The boy broke his leg, and he also fell off his bicycle.* Thus, while the "and" in Ex. 2a is read as indicating a continuous flow from the first event to the second, in Ex. 2b "and" is read as indicating a disjunction of these two events. (Developmentally, the first form suggest a precursor for causal relatedness, the second for adversative relatedness.) Consideration of pairs of sentences of this type have led us to realize the important role which apriori assumptions about relationships between the content themselves play in determining the kind of meaning-function which a listener will "read into" particular sentence constructions.

Focal Questions

We are currently interested in two questions: 1) the acceptability of alternative forms of linguistic construction, when content is held constant; and 2) the semantic equivalence of linguistic forms, when content is held constant. At this stage, our primary concern is with normative data--i.e., with the choices or preferences of intelligent, educated, native-born, adult speakers of the language since these forms seem essential to an adequate interpretation of any developmental trends which we might subsequently discover. A preliminary inquiry into these questions has suggested two factors which may exert an important influence on these choices:

(1) Degree of relationship.- The "ease" with which a listener can see the referents of a pair of clauses as "going together", or being related.

(2) Strength of temporal ordering.- The extent to which the listener perceives the referents of a pair of clauses as necessarily occuring in a fixed temporal order.

General Approach

We will be initially concerned with the following types of clause connectors: semi-colon, *and*, *when*, *because*, and *if...(then)...* These can be seen to constitute an ordered series in a number of respects.

(1) Specificity of implied relationships.-If we assume that a particular connective in a particular instance demands of the listener the ability to establish for himself the kind of relationship which seems implied in the conjunction used, then this series can be seen as progressing from a very "loose", "open-ended" set of demands (semi-colon), to a very precise and stringent set of demands (if...then...). Since the semi-colon puts no linguistic restraints on the listener, he is left free to form any relationship between the clauses he chooses. Hence, a wide variety of statements connected by a semi-colon will be found acceptable by him. The if...then...form, in contrast, demands of the listener that he be able to establish between the referents of the clauses a relatively specific and restricted set of relationships: e.g., logical, hypothetical, conditional, counterfactual, etc., hence, only a very restricted set of clause-pairs will result in acceptable sentences, when fitted into this form. Even in this case, however, the particular form of relationship understood by the listener depends upon factors other than the connectors themselves. Thus, for example, the shift in both verb tense and article in the sentences:

If the figure had three sides, then it was a triangle.
If a figure has three sides, then it is a triangle.

leads us to interpret the first statement as an empirical conditional proposition, in contrast to the second, which takes on the character of a formal or logical definition. While the same form, with a somewhat different content--e.g., *If the figure has three sides, then it is red*--leaves us at a loss as to what could possibly be meant, in the absence of some further contextual clarification. Or, finally, consider sentences of the following type: *If Kennedy was assassinated, then Johnson is President.* Sentences of this type sound awkward to us precisely because the clauses refer to established facts, while the form asks us to treat these facts as either logical, hypothetical, conditional, or counterfactual. Confronted with such a sentence we are quite literally at a loss as to how to proceed--how conceptually to "follow the instruction" implicit in the form itself. All we can reasonably say to the speaker is "What do you mean?" and hope for some clarification. As we progress through this series of clause connectors, we observe three trends: 1) a progressive restriction in the speaker's freedom to apply a given form to a given content; 2) a progressive restriction in the listener's freedom to infer a relationship from that form; and finally, 3) as the result of these restrictions the possibility for a progressive increase in the precision of communication between speaker and listener.

(2) Developmental progression of relational forms of thinking.- This series can also be seen as representing a progression in the conceptual basis for relating event: viz, juxtaposition (semi-colon), unspecified but explicit relatedness (and), temporal dependency (when), causal dependency (because), and conditional dependency (if...then...). This progression is of interest because it parallels the developmental progression from the concrete, momentary, sensory-motor orientation toward events, to the abstract, enduring, and conceptual orientation, described in various ways and demonstrated in a variety of contexts by Cassirer, Piaget, Werner, and others.

General Methods

We are currently designing a test booklet containing four different kinds of items. Each type of item is designed to assess one of the four variables described above: viz., level of association, strength of temporal ordering, degree of acceptability, and level of semantic equivalence.

The general format of each type of item is described below. Details of design and procedure will be contingent upon the outcome of a series of pilot studies.

(1) Level of association.- Each item consists of a pair of simple declarative sentences: e.g.:

A boy falls off his bicycle.
A boy breaks his leg.

or

A boy falls off his bicycle.
A boy is Chinese.

For each pair of items we will be interested in, for example, how easy it is for the subject to see some relationship between these two facts, or, alternatively, how likely he thinks it is that these two events will occur together.

(2) Strength of temporal ordering.- Each item consists of a pair of sentences, as above. Here, we will be interested in the subjects'answers to the following questions: (a) Assuming that both of these facts were true, is there any reason to believe that one is more likely to occur before the other in time? (b) If so, which is most likely to occur first? (c) How frequently is this order likely to occur?

(3) Degree of acceptability.- Each pair of statements used in parts (1) and (2), above, will be combined to form a set of more complex sentences. The sentence within each set will be identical in content, but differ in either (a) the type of clause connector used, (b) the order of the clauses with respect to the connector, or (c) both. Each sentence will be presented separately. Here we are primarily interested in whether each sentence sounds "acceptable" or "awkward" to the subject.

(4) Level of semantic equivalence.- These items consist of pairs of complex sentences, drawn from those used in part (3), above. The two members of a pair will be similar in content, but will differ in the type of clause connector used; the order of presentation of the clauses with respect to the connector; or both. Here we are primarily interested in the degree to which the subject sees the number of each pair as semantically equivalent to another.

In summary, if the acceptability and semantic equivalence of alternative sentence forms is dependent upon the apriori associative and temporal relationships which the subject perceives as existing among the referent events themselves, then, the results of parts (3) and (4) should be predictable on the basis of the results of parts (1) and (2).

Background and Significance of this Research

Although a normative study of the role of content in determining the acceptability of alternative linguistic forms for the expression of relationships of temporal, causal, and logical relatedness would seem to be of critical importance, both for the psychological study of the development of such forms, and for the linguistic analysis of the normative language itself, the dearth of data with regard to this problem is striking. While some of the psychological studies (e.g., Minkus and Stern) are counterbalanced for the effects of content upon the choice of "logical" connectives, only Piaget appears to have made any systematic attempt to differentiate the role which different types of content play in determining these choices (c.f. Piaget's distinction among motivational, mechanical and logical types of causality). His efforts, however, have been directed specifically toward the investigation of developmental trends in the expression of causal connectedness. Hence, he provides us with little information concerning either adult expressions of causal connectedness, or the role of content in determining the use of other forms of connectedness. In the linguistics literature, as far as we know, only Sledd has dealt in any detail with this particular problem, and his treatment is primarily anecdotal and illustrative, rather than systematic.

From the psychological point of view, knowledge of such normative preference seems to us critical for an accurate appraisal of the results of developmental studies since adult usage generally provides the directive goals for such developmental trends. From the linguistics point of view, it is our belief that much of the difficulty in systematically analyzing and describing the form and function of compound and complex linguistic forms stems from a lack of any normative information concerning the conditions under which these forms are acceptable, and the conditions under which alternative forms are semantically equivalent. We believe that a fully adequate understanding of both the psychological and the linguistic basis for the use of these linguistic forms must be firmly grounded in an understanding of those interactions between form and content which leads an individual to prefer one form of sentence construction to another.

5. Two-Person Communication Game: Formulating and Understanding Instructions

One of the general goals of our broader program of research was to determine whether the social and economic subcultural groups under investigation differed in the degree of linguistic flexibility which they exhibited--where "flexibility" is understood, in a relatively loose sense, to refer to the ability to modify or shift the characteristics of the speech patterns used in a manner appropriate to corresponding shifts in the context in which communication takes place. The term context here is used to refer, not primarily to the physical setting in which communication occurs, but, more importantly, to (1) the relationship of speaker to listener, (2) the relationship of speaker and listener to the concrete field of reference, and (3) the purpose of the act of communication.

One of the purposes of the present investigation was, initially, to obtain speech samples from subjects in a context which differed markedly from that of the Narrative Discourse studies.

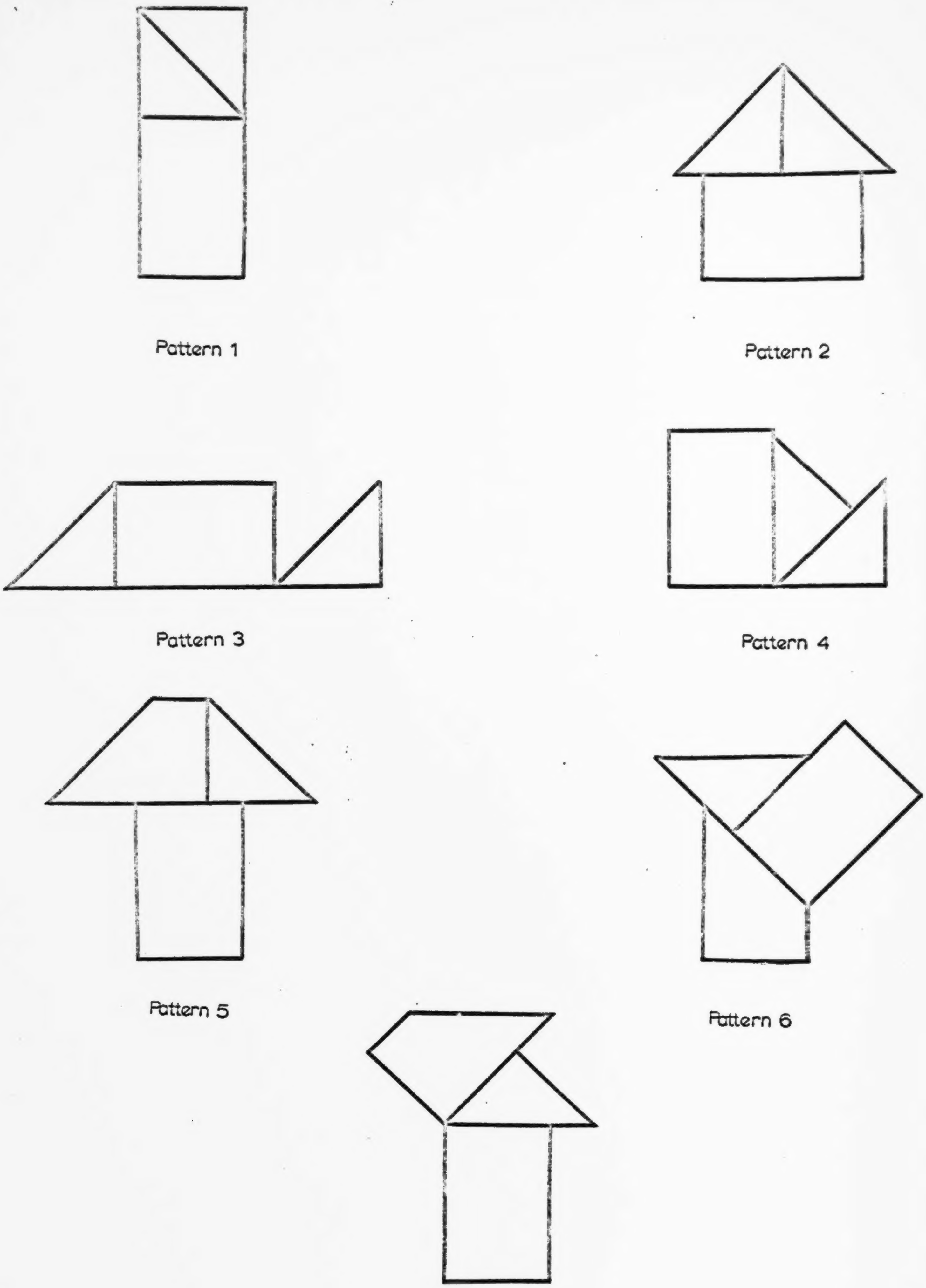
General Procedures.- The basis experimental situation involves two subjects, a "speaker" and a "listener" seated back to back. Each has before him a series of objects (1/8 inch colored plexiglass geometric patterns). The experimenter arranges these objects in a pattern for the speaker, who must then instruct the listener in such a way that the latter can correctly reconstruct the pattern with his own objects. There are seven patterns in all (see following page). Although both subjects have identically shaped objects (two isosceles triangles, a rectangle, and a trapezoid), the colors of these objects are different for the speaker than they are for the listener. By varying the colors of the otherwise similar objects, we were able to limit the effectiveness of simple color description and compel an object-naming mode of procedure.

Comparison with the Narrative Discourse Procedures.- The present procedures can be seen to differ from those of the Narrative Discourse procedure in the following respects:

1) In the earlier procedure the speaker addresses himself directly to the experimenter (an "authority" figure) whereas here he addresses himself directly to a peer.

2) In the earlier procedure the speaker and listener are in a face-to-face confrontation, which readily permitted the use of facial gestures and deictive modes of reference as a supplement to purely verbal means of communication. In the present back-to-back situation, neither of these nonverbal supplements is possible. In other words, in the present situation, in which speaker and listener do not share the same concrete, perceptually grounded field of reference, adequate communication would seem to demand a shift to a much more verbally structure, verbally atriculated mode of speaking.

3) Finally, with regard to the purpose of the communication: in the first study, the primary purpose of the communication was



Pattern 1

Pattern 2

Pattern 3

Pattern 4

Pattern 5

Pattern 6

Pattern 7

Fig. 1. Patterns for Two Person Communication Game

merely to "tell a story", while here, a more pragmatic purpose may be assumed: viz., "to get someone else to do something".

Basic approach to the analysis of the data.- In examining the protocols taken in this situation, we were not primarily interested in the subject's ability to solve the problems, but rather in the linguistic sample generated in the particular circumstances of this problem solving situation. What was of interest to us with respect to these linguistic samples was how the mode of utterance adopted by the speaker either facilitated or debilitated the successful carrying out of the problem solving function; whether a geometric-technical mode of description was an obsolute advantage; what kinds of substitutions, transformations, and alternative modes were utilized when the geometric-technical was not available, and with what effectiveness in terms of this particular event of communication.

Study 1.- The first study involved two groups of subjects: One was comprised of freshmen at WSU, (N=26) the other, of boys and girls from the Franklin Settlement House, (N=32) located in the heart of the Negro section of inner-city Detroit. The university students were 17-19 years old, the inner-city Negro group was between 16-18.

Preliminary Results and Discussion

Geometric vs. metaphoric modes of solution.- Although solution times for both groups were about equal, there were immediately noticeable differences between the two groups. The differences, then, were in the modes of solution rather than in the ability to solve the problems. Perhaps the most noticeable among these differences was the increase in the use of metaphoric description peripherally and as an adjunct to a predominating geometric-technical mode, metaphoric description enters as a dominant mode in the inner-city procedure far more often. Although the quantitative predominance of one mode over another is in itself interesting, it is difficult to analyse by itself. What here presents itself for further analysis is how these two approaches are integrated so as to form a continuous coherent discourse. The ability to shift modes without an accompanying disjunction of the description is crucial to effecting coherent and communicative discourse. With the inner-city subjects there is sometimes a sole dependence on the mode of metaphoric description. For example, the speaker will instruct the listener to arrange his pieces so that they "form a house". Having done this he feels he is finished and is ready to go on to the next problem. Another kind of disjunction occurs when, after a lengthy unsuccessful interchange, the listener demands to know what the pattern looks like. The metaphoric description here becomes an alternative to the geometric technical mode. There is an abrupt shift and the metaphoric description is not looked at in the context of the preceding instructions. What happens here is that a nearly completed problem will be completely rearranged to the detriment of its solution.

We do not take the split between the geometric-technical and metaphoric modes of description to be an ultimate dichotomy. Both are these modes should be subsumed by any adequate event of communication. What is critical is the ability to adopt and integrate manifold modes. Preliminary investigation indicates that the inner-city subjects while realizing the importance of geometric-technical description to the task can not integrate it. Thus their geometric-technical vocabulary is not stable, and although they know the differences between triangle, rectangle and square, all these names may be used to describe the same object. Although the question of lability of naming originated in the context of the Two-Person Communication Game, it was so fascinating an area that we have isolated it as the subject of a number of follow-up studies to be described later on in this proposal. The inner-city subjects adopt but never really integrate the geometric-technical mode. Nor, as we have already indicated, do the college students really integrate the metaphoric mode. It rather exists for them as a distinct mode, a kind of afterthought, which is tacked on at the end but which does not enter as a functionally integral part of the problem-solving.

Metaphoric integration: Quality of the images.- Perhaps to be expected in light of the preceding is that the quality of the images in the inner-city is more heightened. Where the college student's adjunct to a geometric technical description ends in using the analogy of house and rooftop (cf. pattern 2) the inner-city subject takes even this worn metaphor much farther--"A shoe (the trapezoid) stepping on the roof of a house...put the heel of the shoe...etc."

There is an increase in the integration of representational objects into the test situation in the inner-city group: the subject will use the pictures on the wall, doors, water fountains, etc. to facilitate his listener's orientation of the objects. "Place it like the blocks (cinder blocks) on the wall." There is virtually nothing of this kind in the college sample.

Even where it is obvious that the inner-city subjects have a command of the geometric-technical vocabulary adequate to this relatively simple task, there is a tendency for them to do everything they can without it. For instance when they find that color description is inadequate, the college students invariably proceed to a geometric description, where some inner-city subjects will actually assume their listener's colors and use them to persist in the color description, a procedure which, for them, is far more complicated than the shift to a more geometric description.

Geometric integration: Quality of syntactic structures.- It is interesting to note, in light of the Whorfian presuppositions of this project, that the linguistic relativity hypothesis is borne out by elements of this study. The predominating linguistic mode used by the college freshman takes the form "Place _____ so that _____." This form is almost totally absent in the inner-city subject group, where the concentration is merely on the placing of one piece, (place the triangle to the left of the rectangle). The college students are forced by this syntactic form into a more sophisticated kind of problem solving, for not only is the placing of one piece instructed, but also the specific relationship of that piece to another. (Place the triangle to the left of the rectangle so that its hypotenuse lies along the left-short side of the rectangle.) The absence of this form in the inner-city is itself an important observation, but what we then notice is that almost invariably there is a long pause after the "so that". What seems to be happening is that the college students are delivering an empty form. For them the problem demands a "Place _____ so that _____" syntax. This syntax is delivered first, there is then a long pause, then the cognitive processes needed to fill out the form proceed. Language is in this instance clearly prior to thought, the thinking out of the relationship between the placed piece and the surfaces of the piece against which it is to be placed is dictated and partially determined by the deliverance of an initially empty syntactic structure. An example may serve to clarify this line of thought.

"*Place* the longest side of the third object *so that* ... you know *so that* all these ... uh ... *so that* the ... oh, uh ... you're going to *place* the longest side against the side of the triangle ..."

Here it seems likely that the subject, after delivering the empty form, finds that she can not adequately describe the relationship within the already syntactically-defined structure she has set up for herself. The thought following the first "so that" has generated a new syntactic structure (utilizing "against" to fill out the relational description originally dictacted by "so that") and the subject must start a new sentence.

Our experimental groups seemed to exhibit two distinct approaches to the way in which the speaker went about instructing the listener how to construct a pattern. Where the college group tended to employ both, a *linear-analytic* and a *synthetic strategy*, the inner-city group employed primarily a *synthetic strategy*.

A *synthetic* strategy is one in which the speaker begins by describing to the listener what the final product, as a whole, will look like. For example, "put them together so that they make a house", or by handling the problem in terms of assembling sub-gestalts "put the two triangles together to make a square; put the square..." A *linear*-analytic strategy is one which the speaker begins by describing how to place each block, one at a time, in a serial fashion. For example: "place the rectangle so that its shortest side is parallel to the table; now place the triangle on top of the rectangle so that ... etc".

These immediately noticeable differences in instructional strategy provided the basis for a more rigorous study described below.

General categories of analysis.- The protocols collected in these studies are being analyzed in terms of the general system of analytic categories constructed on the basis of the Narrative Discourse protocols. While the general principles remain the same, certain modifications in detail are introduced which reflect the distinctive nature of the communication-of-instructions context, as opposed to the narrative-discourse context. For example, whereas the basic unit of analysis in the previous studies was the simple, declarative sentence, here it is, more appropriately, and normatively, the simple imperative sentence.

The most important differences, however, will occur with regard to those analyses which involve the semantic, rather than the syntactic structure of the speech samples. In the present case, for example, the archetypal story of the Narrative Discourse analysis, is replaced by an archetypal method of solution: the story elements by instructional elements, etc. It will be noted that none of these changes in any way materially effects either the principles upon which the previous analysis were based, or the specific procedures to be used in analyzing the protocols, once the relevant archetypes have been constructed.

Study 2

In our initial study, we specifically chose groups which were known to be markedly different from each other by a number of independent criteria--social class, subculture, education, etc.--in order to determine the general utility of the methods we were using and the range of responses which we could expect this task to elicit. The results of the initial study were so promising, that we now have undertaken a more systematic investigation of the degree to which educational and/or cultural factors contribute to the differences we observed.

This study compares middle-class and inner-city Negroes and whites 16-18 years of age. The inner-city group itself is further divided into high school students and high school drop-outs. (The high school students with the cooperation of the Detroit Board of Education; the high school drop-outs with the cooperation of the Neighborhood Youth Corps--an adolescent job training branch of the Detroit O.E.O. program.)

Thus far two groups of subjects have been tested: an inner-city Negro "drop-out" group (N=19 pairs) and an inner-city Negro high school group (N=14 pairs). As this testing program is still in progress, no results will be available for some time.[6]

Plans for Further Research

The Two Person Communication Game will be adapted for a more detailed investigation of three important questions within the general framework of our program.

(1) The conceptual integration of series of "discrete" events.- The problem of the means by which a temporally ordered series of discrete events is integrated into a conceptual continuity has long

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[6] All of these subjects are also given our Narrative Discourse and our Sentence Completion tasks (described above), as well as our Force Differentiation and Multiple Choice tasks (described below).

been recognized as a critical developmental problem (i.e., Cassirer, Piaget, Schnall). The "problem", from the subject's point of view, is that of recognizing the invariance of certain "essential" characteristics of the members of the series, despite progressive changes in its remaining characteristics. In Piaget's terminology, the problem is one of the subject's ability to "conserve" certain attributes of a temporally distributed series, while, at the same time recognizing a systematic variation in others.

The Two Person Communication Game lends readily to an investigation of this problem, in a "naturalitic" setting. Specifically, we plan to construct a series of patterns in which successive patterns in the series differ from each other by a single transformation. In the series of three patterns shown on the following page, for example, each successive pattern differs from the previous one by a 90° rotation of the one of the patterns.

As the general method is that of the Two Person Communication Game, the degree to which the speaker describes each successive pattern as a "modification" of the one immediately preceding provides an index of the degree to which he has spontaneously conceptualized the succession of patterns as a continuous series which is undergoing systematic transformations. On the other hand, the degree to which he begins his description of each successive pattern anew, without reference to what has preceded, is indicative of a lack of such conceptualization.

This problem is of particular interest to us, since it is our hypothesis that the linear-analytic strategy (described above) should facilitate the conceptualization of the sequence as a series, while the synthetic (i.e., sub-gestalt and metaphoric) modes should increase the difficulty of grasping this underlying continuity of form. Since the linear-analytic modes involves a description of the individual pieces more or less in isolation, and since most of the pieces, at this level, remain in fact, invariant in their orientation, the linguistic similarity of the descriptions in successive patterns should facilitate the conceptualization of the continuity of the series itself. The synthetic modes of description, on the other hand, rely on the perception of "wholes"--i.e., combinations of pieces. Since the impression of the whole may vary markedly with a rotation of even one of its parts, the language itself, in these cases, may provide a serious obstacle to recognition of the underlying continuity.

In summary, then, this entire line of investigation may be taken as providing an experimental paradigm of the Whorf-Sapir linguistic "relativity" hypothesis.

This method is particularly elegant in that it permits us to systematically vary both the type and complexity of the transformations involved in each series, hence to localize particular strengths or weaknesses in this ability at different age levels and among different social and cultural groups.

(2) Social roles and modes of communication.- In our initial studies, for simplicity's sake, we picked pairs of subjects who belonged to the same peer group in terms of age, race, education, social class, etc. The general method, however, lends itself equally well to an investigation the role of social relationships in determining modes of discourse. Thus, for example, we suspect that an inner-city Negro high school drop-out will instruct one of his own peers in quite a different "language" than he would use to instruct a white, middle-class, Wayne State University freshman. Or again, when speaker and listener are of markedly different age groups (i.e., school teacher and grade school pupil) we would expect quite a different mode of discourse to emerge than when either is addressing one of his own peers. This soical-psychological investigation of language structure is a second line of investigation which we are planning for the future.

(3) Developmental shifts in instructional discourse.- It is, of course, widely held that increasing levels of mental maturity are accompanied by a decreasing tendency toward an "ego-centric" view of the world. Adequate performance on the present task, of course, demands of both speaker and listener exactly that kind of "decentering" which is the hallmark of such maturity. We therefore plan to undertake a study of developmental shifts in the structure of the language used in instructional discourse. Although others are currently engaged in similar investigations, (cf. Krauss, et. al). we believe that the use of geometric forms will lend the result of our investigations a distinctive character which will provide a unique insight into modes of geometric conceptualization, as well (see below).

4. The Naming and Conceptualization of Simple Geometric Forms and Spatial Relationships[7]

This is a cross-cultural and developmental study of the relationship between language and thought, as it is realized in the naming, conceptualization, and concrete manipulation of simple geometric forms (e.g., triangles and quadralaterals), and of certain simple spatial relationships (e.g., next to, on top of, etc.) Interest in this problem arose from our desire to obtain a more satisfactory understanding of the conceptual basis underlying the system of naming employed by our "inner-city" subjects on the Two Person Communication Game: viz., the absence of a well differentiated technical vocabulary and the presence of a great deal of lability in the symbol-referent relationship.

In the present series of studies, we have focussed upon two aspects of geometric and spatial conceptualization: that of the invariance of geometric form over rotational transformations of these forms, and that of seriation.

Theoretical Background

The Concepts of Invariance and Seriation.- Both Cassirer (e.g., 1923) and Piaget (e.g., 1965, pp. vii-ix; 1960) have held that the concept of invariance, together with that of seriation, are the sine qua non, not only for the formation of geometric concepts, in particular, but, indeed, for abstract concept-formation itself. The concept of invariance implies that a specified set of formal relationships are recognized (by the subject) as remaining invariant over transformations of all other attributes of an object. Thus, the ability to seriate itself implies the ability to hold certain attributes of an object invariant, while recognizing an orderly progression of yet other attributes of the "same" object, Hence, these two abilities in combination constitute a necessary prerequisite for the understanding of all classificatory systems of the genus-species type.

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[7] This entire line of investigation is detailed in a technical report, a copy of which has been submitted under separate cover. Only the barest details are summarized here.

The Seriation of Geometric Forms and Their English Names.-Triangles and quadrilaterals are of particular interest for present purposes for three reasons: First, the species within each of these two genuses have a well differentiated system of specific names; secondly, the system of naming within each genus can be mapped into a "transformational" taxonomy--i.e., a taxonomy in which successive elements within each series can be generated, one from the other, by a series of single-step transformations; and, thirdly, the systems of naming species within each of these genuses is based upon quite different principles.

(1) Well differentiated systems of naming.- In conventional English terminology, it is possible to uniquely name at least 6 different species of 4-sided figures (see Fig. 2) and 7 different subspecies of 3-sided figures (see Fig. 3). Since we are not here specifically concerned with a formal mathematical geometry, but, rather with the formation of geometric concepts, the existence of such a well differentiated conventional linguistic series is of great aid in our general investigations.

(2) Principles underlying the two systems of naming.- The structural principles underlying these two systems are quite different from each other. With respect to the 3-sided figures, the complete name of each particular figure includes the name of its genus, triangle, and the names of its species determinants, isosceles, right, etc.--a nomenclature explicitly based upon a species-genus principle, similar to that employed in descriptive biology. Within this series, the correct particular names of the members of the series provide some clue as to how, systematically, they are related to one another. For the 4-sided figures, on the other hand, each member of the series has a unique name which in no way reveals either the generic communality (i.e., invariance), or the specific differentia (i.e., seriation principles) of the various species within the series.

Cassirer (1952) and Werner and Kaplan (1963) have argued that this latter type of naming, in which each member of a continuous series is given distinctive (almost a "proper") name, is both developmentally earlier and linguistically more primitive than the species-genus principle utilized in the naming of the 3-sided figures.

(3) Conceptual ordering of the geometric forms.- Figure 2 shows a transformational taxonomy for the 4-sided plane figures. The most general form of the 4-sided figure is the quadrilateral,

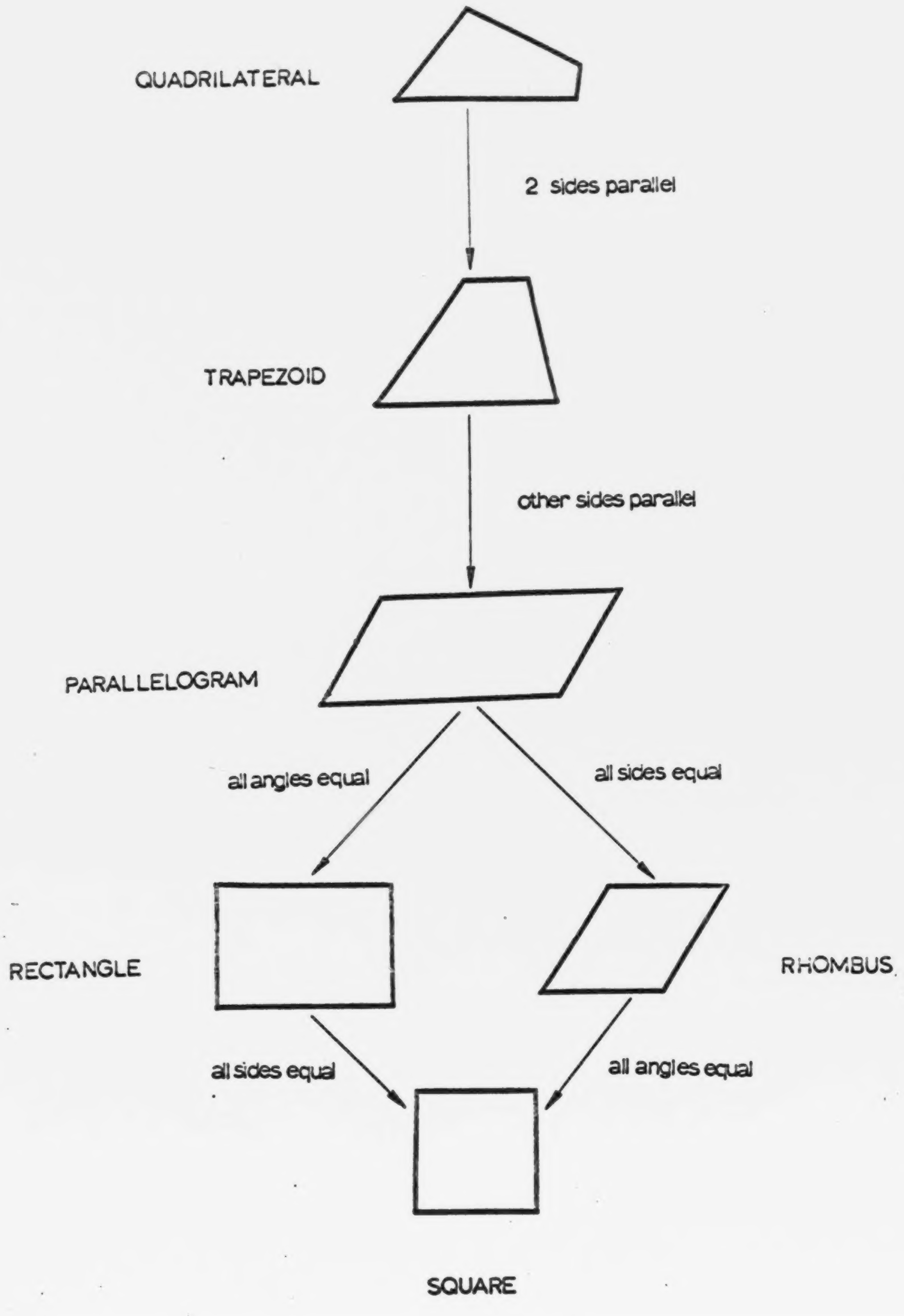
QUADRILATERAL
2 sides parallel
TRAPEZOID
other sides parallel
PARALLELOGRAM
all angles equal
all sides equal
RECTANGLE
RHOMBUS
all sides equal
all angles equal
SQUARE

Fig. ~~3~~ 2. Geometric Technical Taxonomy: 4-Sided Pieces

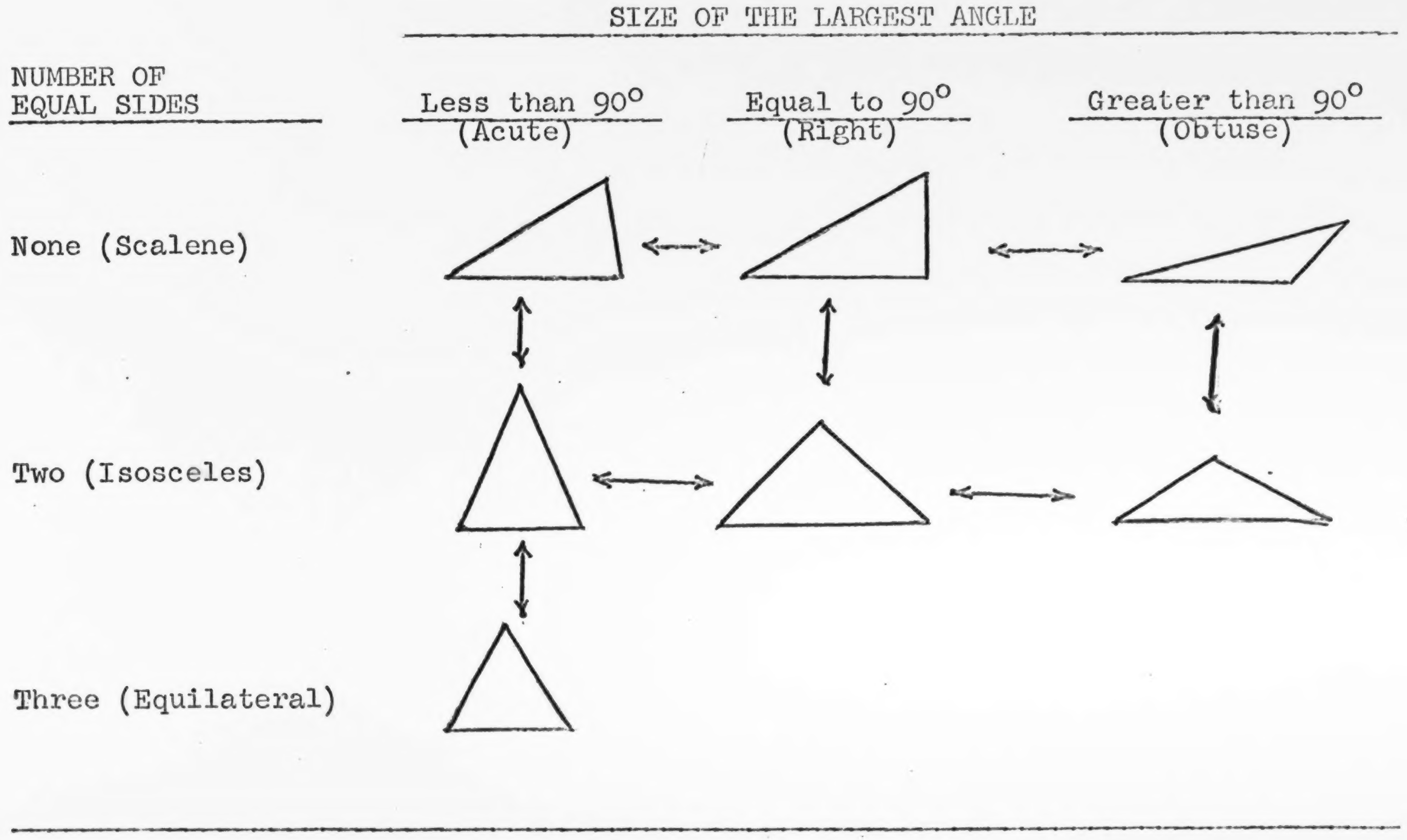
SIZE OF THE LARGEST ANGLE
NUMBER OF EQUAL SIDES
Less than 90° (Acute)
Equal to 90° (Right)
Greater than 90° (Obtuse)
None (Scalene)
Two (Isosceles)
Three (Equilateral)

Fig. 3. Geometric Technical Taxonomy: 3-Sided Figures

which requires, by definition, only that a figure have 4-sides and be closed. From the quadrilateral we can generate the trapezoid by adding the requirement that one pair of opposite sides be parallel. To go from trapezoid to parallelogram we need only require that the remaining pair of opposite sides be parallel. Given the parallelogram, we may impose either one of two restrictions independently: viz., that all sides be equal, or that all angles be 90°. The first transformation yield a rhombus, while the second yields a rectangle. Finally, the square may be generated either from the rhombus by imposing the restriction that all angles be 90°, or from the rectangle by imposing that all sides be equal. Thus, this system is predominantly hierarchical -- each higher definition in the system includes, but is not included in, each of the lower order definitions.

The system for ordering 3-sided figures, on the other hand, seems to be based upon two independent and co-ordinate criteria: size of the largest angle, and number of equal sides (Fig. 3). Hence, these collectively constitute a coordinate system within which each geometric form type is represented by the intersection of its position on two, more or less independent dimensions. (The sole exception is the "equilateral triangle", which, by definition, must always be acute.)

One of the implications of this difference in type of underlying taxonomy is that, whereas concrete instances of the quadrilaterals can be taken as representing different levels of "abstraction" or "generality" of the conceptualization of four-sided figures, no such "levels of abstraction" are possible for particular three-sided figures: all concrete instances of three-sided figures are, in this system, equally specific.

In light of these implications, therefore, it is now possible, in principle at least, to attempt to gather evidence which partials out the degree to which developmental and subcultural differences in describing and classifying geometric forms represent mere nominal differences, and the degree to which they represent fundamental conceptual differences in the way in which these forms are seriated. (As we shall see below, certain of our experimental groups utilize a formally similar, but hierarchically inverted structure for the naming of 4-sided figures.)

Invariance Over Specifiably Irrelevant Transformations

Implied in the ability to seriate a set of particular forms under a single conceptual schema is the ability to recognize the invariance of certian characteristics of a set of objects over a variety of transformations in all of its remaining attributes. The concept of invariance implies that a given geometric figure will maintain its identity as "essentially" the same figure over transformations in all of its (geometrically) "accidental" properties--i.e., for example, rotation, size, shape, color, location, etc.

Fig. 3a shows the square in two rotations. An adequate geometric conception of this figure must grasp the fact that both forms in Fig. 3 are, from the geometric point of view, "really" squares, even though, from the perceptual point of view, one of the two looks like a diamond.

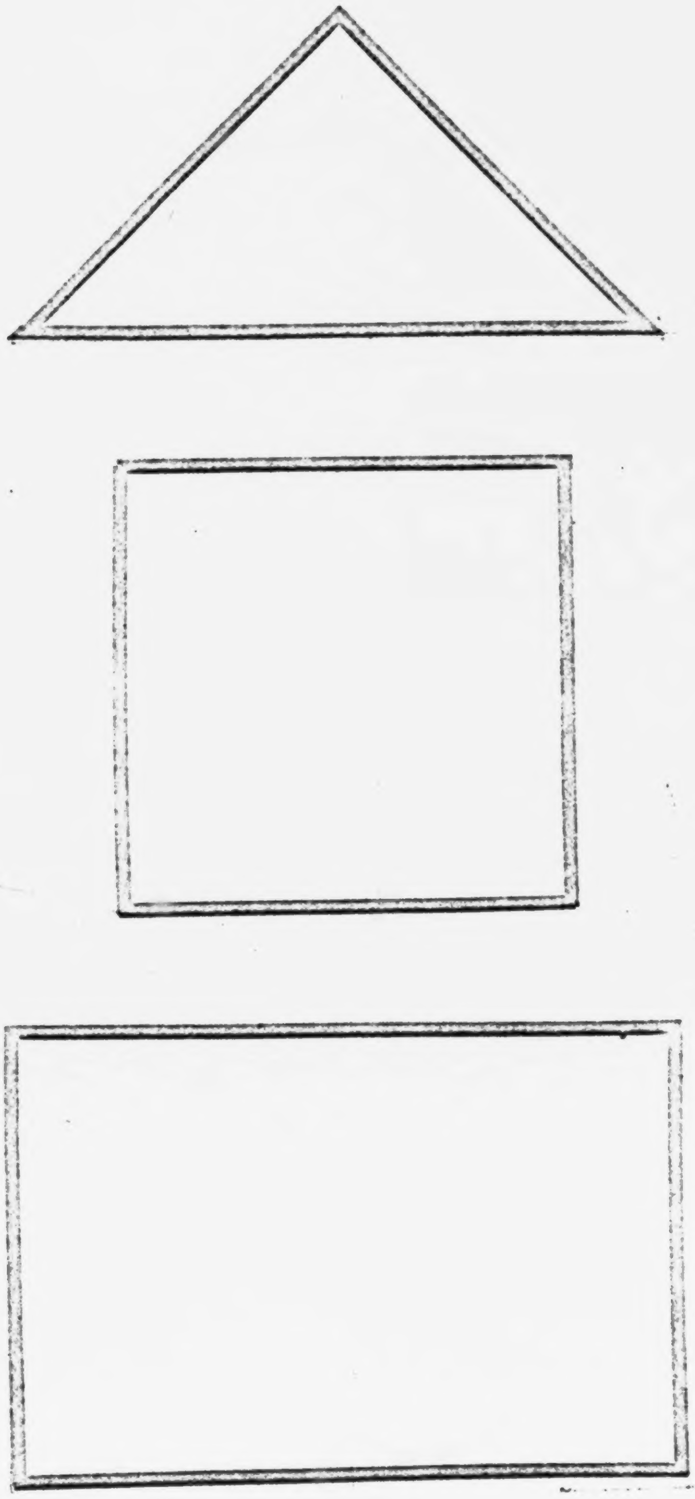

Fig. 3a

According to developmental theories, this lack of ability to see invariance should be characteristic of a generally lower level of geometric conceptualization.

With reference to linguistic expression, the two rotational transformations of the square, let us say, can be handled in at least four formally distinct ways:

1) Transformation dominates, invariance ignored.- "This one is a square. This other one is a diamond."

2) Transformation dominates, invariance subordinated.- This is a pure square. This is a square-shaped diamond."

3) Invariance dominates, transformation subordinated.- "This is a regular square. This other one is a rotated square."

4) Invariance dominates, transformation ignored.- "They're both squares."

These four examples represent according to the developmental point of view, an increasing progression from the least to the most rotational invariance, insofar as this invariance is represented in the linguistic structure of the subject himself.

A Background Study: The Two Person Communication Game

The performance of our "inner-city" subjects, during the Two Person Communication Game was distinguished by the following characteristics: lability of symbol-referent relationships; difficulty in ignoring the presence of color even when its irrelevance was recognized; the use of audile-tactile modes of communication; the use of contextually bounded frames of reference; and, finally, the tendency toward a synthetic, as opposed to a linear-analytic strategy. This configuration of results was particularly exciting to us, as it constituted a complex of phenomena which the genetic epistemologists, in general, and Werner and Cassirer, in particular, have postulated as distinguishing developmentally lower from more advanced levels of cognitive functioning.

Forced Differentiation Task

While the Two Person Communication Game provided valuable insights into the general nature of the differences between our two groups in the way in which geometric information is communicated, this task itself did not begin to exhaust the linguistic subtleties or the descriptive power of either the geometric technical or the inner-city language. Given the relatively restricted number of different forms involved, and the relatively circumscribed nature of the task, a wide variety of different technical and non-technical names could be equally effective in communicating the necessary information, hence individual subjects could exercise a great deal of flexibility in naming pieces without serious penalty to their performance. Given a rectangle, a triangle, and a trapezoid, there is virtually no ambiguity involved in correctly picking out "the funny-looking piece". However, given the eleven different geometric forms, adequate identification of forms would seem to demand a more subtle mode of description. While it was clear, on apriori, grounds that the technical geometric vocabulary was fully adequate to the handling of this more complex task, it was not at all clear, on the basis of the available data, how the inner-city language could or would handle the same situation. The Forced Differentiation Task was designed to "test the limits of adaptability" of the inner-city language in handling more subtle geometric distinctions.

Materials.- The Forced Differentiation Task employed eleven pieces: six quadrilaterals (square, rectangle, rhombus, parallelogram, right-angled trapezoid, and equilateral trapezoid) and five triangles (equilateral, acute isosceles, right isosceles, right scalene, and obtuse scalene). The pieces were made of the same material as those used in the Two Person Communication Game. Each set of eleven pieces was pasted onto 12" x 15" stiff illustration board. Two such boards are used. Corresponding pieces on the two boards were in the same orientation with respect to the viewer, but differed both in color and spatial location. Fig. 4 shows a typical board.

Procedures.- Subjects are seated back to back: one subject is assigned the role of "speaker", the other, the role of "listener". The experimenter points to a particular piece on the speaker's board; the speaker must instruct the listener how to pick out the same piece on his own board. Unlike the communication game, here the speaker is permitted to give a single description, and no feedback from the listener is permitted.

The task procedes in this fashion, one piece at a time, until all eleven pieces have been named once. For each identification given by the speaker, the experimenter records which of the eleven pieces is selected by the listener. The listener's response is of critical importance, since this provides us with an index of the effectiveness of a given name or description for communication within the social reference group, regardless of whether we, as experimenters, find a particular description adequate or not.

Once again, all responses are tape recorded, and analysis is based upon typed transcripts, reference being made to the original tapes where questions of intonational differentiation become critical. The Forced Differentiation task was administered as the second of a three part procedure. Thus, this task was preceded by a shortened form of the Two Person Communication Game described above, and followed by the multiple choice task described below.

Subjects.- Two groups of subjects - a college group (N=19 pairs) and an inner-city group (N=14 pairs) - were compared. This time the inner-city group was drawn from trainees in Detroit's Neighborhood Youth Corps. The college sample consisted, once again of Wayne State University freshman.

Results

The most interesting results of the Forced Differentiation Task fall

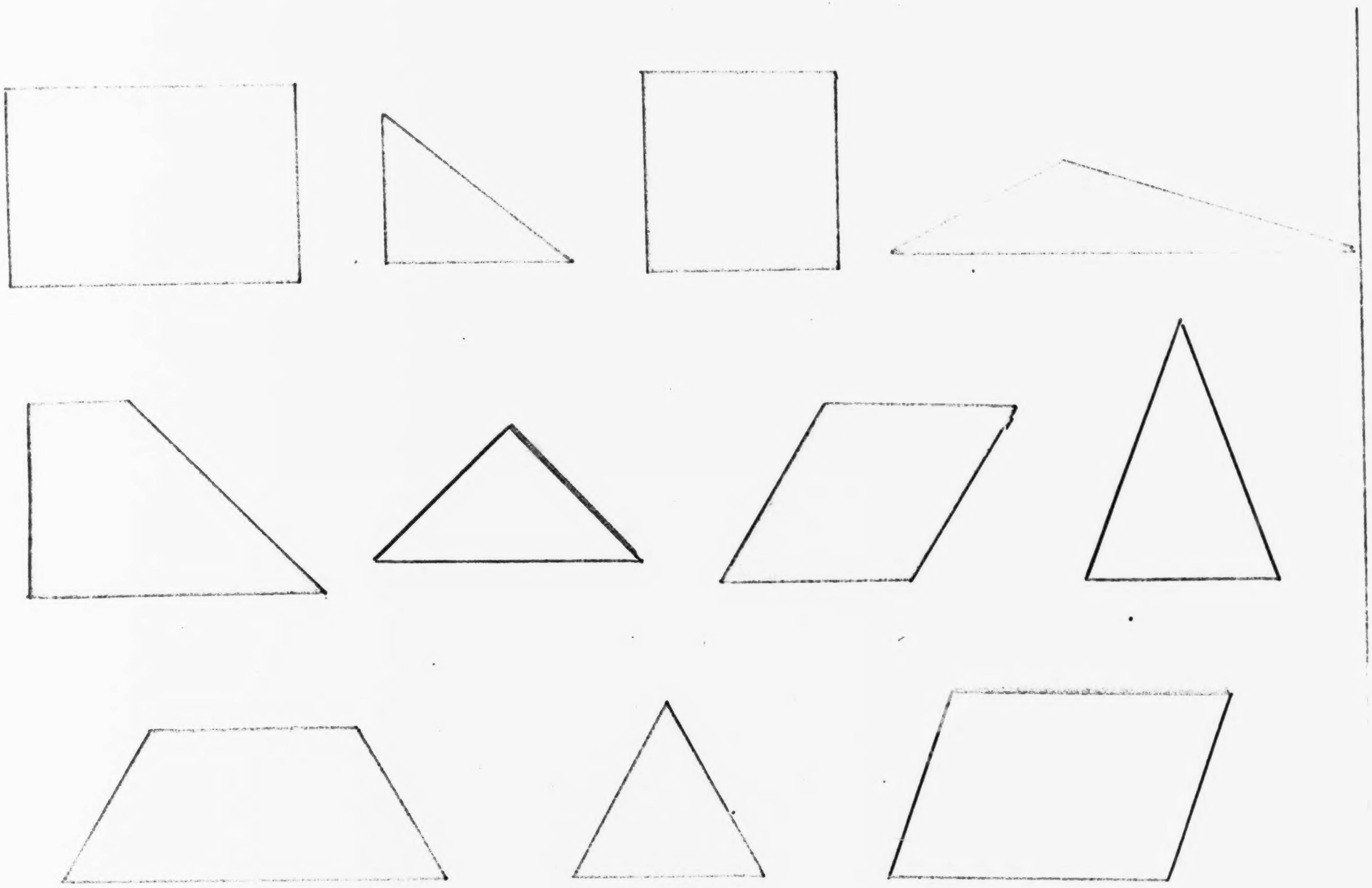

Fig. 2.4 Board for Forced Differentiation Task

into three general classes: those dealing with a categorization of the naming of the pieces; those dealing with the effectiveness of communication; and, finally but most importantly, those which suggested the distinctive characteristics of the underlying conceptual geometric schema of the inner-city group.

(1) The Naming of the Pieces.- The types of nominal description employed by all subjects taken collectively, could be placed into one of seven general categories:

a) Technical geometric names.- Names borrowed directly from the vocabulary of technical geometry: e.g., trapezoid, square, right-triangle, etc.

b) Non-technical or "intuitive" geometric names.- Names which were "in the geometric idiom", but were not technically correct or not entirely within the technical specifications of that idiom: e.g., "long square" for rectangle; or "cut-off square" for triangle.

c) Metaphoric or analogical naming.- The abstract geometric form is named for some real concrete object which is seen as similar in shape: e.g., "a folded handkerchief" for a right triangle; or "upside-down sugar bowl" for an equilateral trapezoid.

d) Synecdotal naming.- The figure is named for one of its more salient parts or characteristics: e.g., "the sharp, pointed piece" for the right-angled trapezoid; "the long-thin piece" for the obtuse triangle.

e) Physiognomic-dynamic characterization.- The static, two-dimensional geometric forms are seen as having dynamic movement properties: e.g., "it's a square wiggling and it looks like it's going zig-zag" for the rhombus.

f) Linear (sensory-motor) tracing of contours.- The piece is neither named nor described as a unified object, but, rather, its contour is described as a linear path which is to be "traced": e.g., "the one that's going down, across, up again, to a point" for the equilateral triangle.

g) Affective-evaluative characterization.- The piece is neither named nor described but is, rather, characterized in terms of the viewer's reactions to it: e.g., "the funny-looking piece" for "the odd-shaped piece" for the right-angled trapezoid.

These categories, in the order presented, may be viewed as constituting an inverse developmental order--i.e., from abstract, conceptual modes of naming, to concrete, affective and perceptual modes of naming. Preliminary quantitative analysis indicates that in this task, as well as in the Two Person Communication Game, our inner-city subjects tend to use fewer technical geometric names and to give a greater proportion of the perceptually and affectively based names than the college sample. Whether, and the degree to which, these differences are owing to a lack of technical geometric sophistication, on the one hand, or to a basic difference in the conceptualization of the figures on the other, could not be determined from this analysis.

However, as we shall demonstrate below, there is some indication, on the basis of other data, that the latter and not the former may be the case.

(2) *Effectiveness of communication*.- The second question which we attempted to answer was whether these differences in mode of describing the figures resulted in any difference in the effectiveness of communication between members of the same linguistic group. Effectiveness was indexed by the percentage of listeners in each group who correctly identified each piece on the basis of the description given him by his speaker. The results of this analysis show that in the case of every figure but one -- the obtuse scalene triangle -- the predominantly technical-geometric vocabulary of the *college group was more efficient* in communicating the necessary information than was the non-technical geometric and metaphoric vocabulary of the inner-city group. However, despite this *relative* advantage of the college group over the inner-city group in this respect, the inner-city group itself does quite well. The mean percentage of correct identification within this group, over all figures,was 56%, as compared with an expectation on a chance basis of somewhere between 11% and 20%,depending upon whether or not the listener assumed that selection was made with or without replacement. (In actual practice, most, but not all subjects assumed that selection was without replacement, as was in fact the case.)

The one case in which the *inner-city group showed greater efficiency* than the college group indicates those conditions under which the inner-city mode of description is *most* effective--viz., when the dominant "perceptual" characteristic of an object *uniquely* defines that object *within a given field*. In the present instance the typical inner-city description - "the longest" or the "thinnest" piece leaves no doubt as to whoch element within the field is being described, whereas the more technical but less well known description "obtuse triangle" may leave considerable doubt unless the listener is also *thoroughly* familiar with the details of the technical subtleties of this language. The limitation of the inner-city approach is, however, that it is *not as invariant* over different concrete fields of reference as is the technical vocabulary.

Finally, both groups found it considerably easier to communicate information about 4-sided figures than about 3-sided figures. This difference, is, of course, exactly the prediction that would have to be made on the basis of the historical linguistic analysis of the systems of naming 3- and 4-sided figures which was discussed above (see pp. 28), hence provides some support for the line of reasoning by which this hypothesis was derived.

One additional analysis of these data seem particularly important, but has not as yet been undertaken: viz., an analysis of the *kinds of errors* which listeners made in attempting to identify the correct figures. For example, it would seem to make a considerable difference in terms of underlying cognitive processes whether, in response to a speaker's description of a *right isosceles triangle*, the listener errs by choosing the *acute isosceles triangle* (a single step transformation in the conventional taxonomy) or errs by choosing the *obtuse scalene triangle* (a two-step transformation in the conventional taxonomy). As we have noted, we have not had time, as yet, to undertake this analysis.

(3) *Conceptual Schema of the Inner-city Non-Technical Geometric Names*.- Both theoretically and practically, the single most interesting and most important result of the Forced Differentiation Task data was the insight which it gave us into the nature of the conceptual schema which underlies the inner-city linguistic mode for naming the four-sided geometric figures.

The figure on the following page shows, diagrammatically a taxonomy of the inner-city system of naming four-sided figures in a form comparable to that previously shown for the conventional English system of naming. Several aspects of this schema are worthy of note.

a) *Inverse hierarchial ordering of forms*.- Whereas the generic form in the conventional English naming is the *quadrilateral* the generic form in the inner-city system is the *square* (sometimes refered to as a "block" or a "box").

b) *Nature of transformations*.- Whereas the primary transformations imposed on this generic form in the conventional language were *parallelism of sides*, *equality of sides*, and *equality of angles*, the primary transformations in the inner-city system seem to be *slantedness*, *length*, and *completedness*.

c) *Comparison of technical and inner-city schemas*.- While these two systems are, to some extent related, the differences between them are, by no means, merely terminological. While these differences did not become apparent until we analyzed the results of a subsequent study, the relevant data are particularly interesting in the present context.

The transformation *slantedness* would, for example, seem, on the surface, to be closely related to the more technical transformation *inequality of angles*: i.e., to derive from the angular relationship between adjacent sides within a particular figure. The evidence seems to indicate, however, that the term slanted has quite a different conceptualization of these figures: viz., the term *slanted* in its most general sense seems to refer to the relationship between *the sides of the figure the vertical and horizontal axes of the concrete frame within which the figure is located* (e.g., the printed page). Thus, a *rhombus* and an off-axis geometrically correct *square* are sometimes both referred to as "slanted squares". In the case of the rhombus, of course, the interpretation is confounded, since the inequality of the angles between adjacent sides makes it impossible for *all* sides to be parallel to the concrete frame. It is only in the square that the true nature of the generic concept of "slantedness" becomes manifest.

A similar situation can be observed with respect to the inner-city transformation "long", - as in referring to the *rectangle* as a "long square". Similarly, on the surface it would seem that the

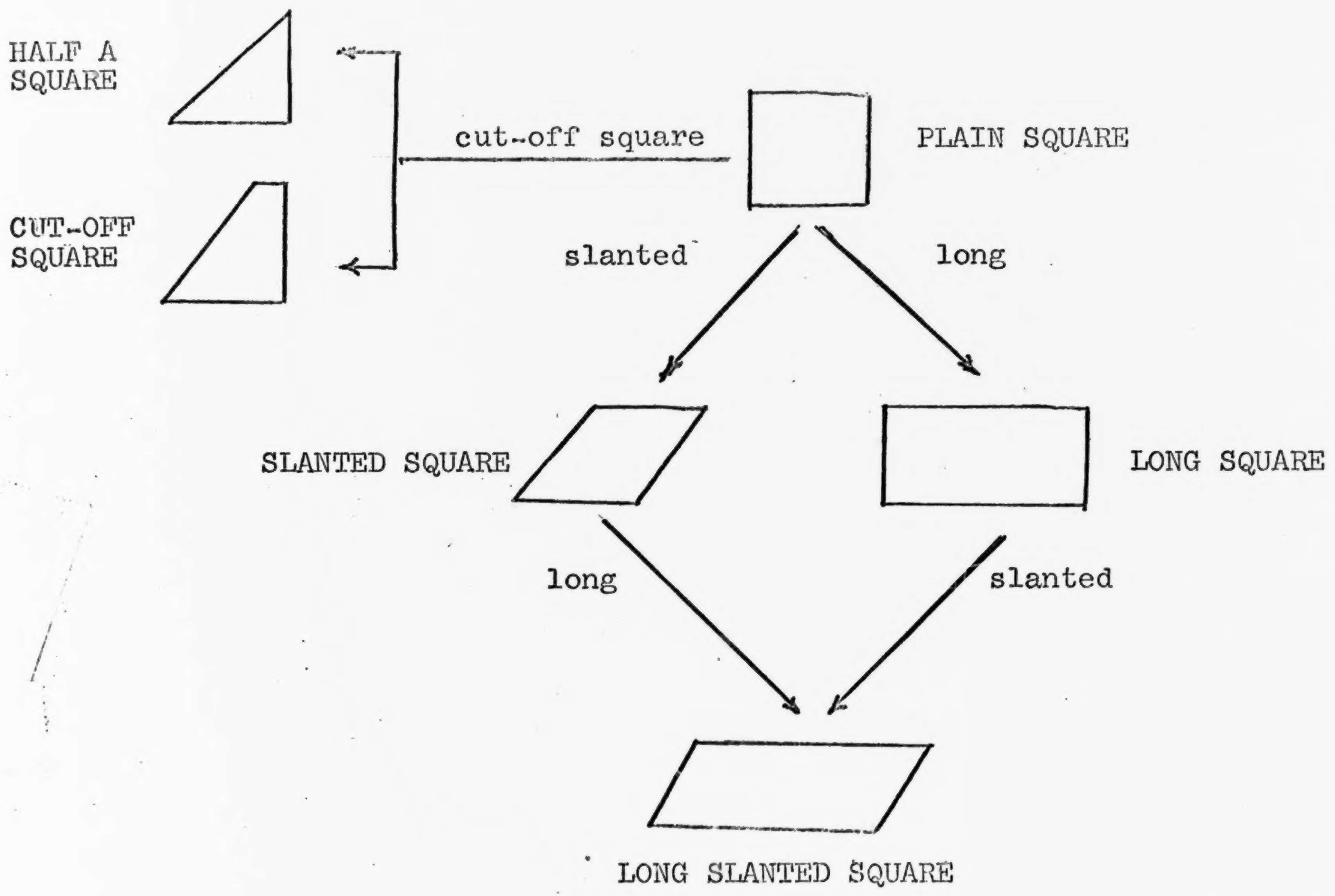
HALF A SQUARE
CUT-OFF SQUARE
cut-off square
PLAIN SQUARE
slanted
long
SLANTED SQUARE
LONG SQUARE
long
slanted
LONG SLANTED SQUARE

Fig. 5. Hypothetical Transformational Taxonomy for Inner-City Non-Technical Names

transformation *long* is the symmetrically transposed inner-city equivalent of the geometric transformation equality of sides: i.e., it would appear that both concepts refer to the comparative length of sides *within* a given figure. That this is not necessarily the case becomes apparent (in our later study) when certain of our subjects insist that, while the label "long square" may be appropriately applied to a *rectangle* whose longest side parallels the horizontal axis, it is inappropriate to apply this term to a rectangle whose longest side parallels the vertical axis. This latter, they insist should be described as "a *tall* square". Thus, once again, it is not primarily the relationship between parts within the figure, but the relationship of the figure as a whole to its concrete frame of reference which is the primary determinant of this system of naming.

In summary, then, this analysis of the underlying conceptual schema of the inner-city nomenclature, while still highly hypothetical, was of interest for a number of reasons, both theoretical and practical.

Discussion

Theoretically, these results harkened back to the distinctions between *portable*-vs.-*contextually* bounded frames of reference, and to the distinction between *linear*-*analytic*-vs.-*synthetic* strategies, which emerged from our analysis of the original Two Person Communications Game. In particular, they gave us some insight into a possible reason for the apparent *lability of symbol-referent relationships* noted in the earlier study: for, if, in general, the naming of these fixed forms is (to some extent) contingent upon the concrete orientation of the particular form with reference to the larger perceptual context in which it occurs, then, in a situation, such as the Two Person Communication Game, in which the subject is free to move the pieces in space as he wishes, and, in fact, in which he must do so to solve the problem, we would, of necessity, expect the *appropriate* name of the figure to vary with the particular rotational aspect which was dominant at that particular moment. These results were completely compatible with the comparative developmental framework of Wernerian theory, in which lower levels of intellectual development are characterized as possessing exactly the kinds of perceptual groundedness, contextualization, and lability which we were finding. (While such results in no way "proved" these "theories", they at least indicated the potential value of this general framework for interpreting data of this type.)

From the practical point of view, this analysis suggested a further study, which allowed us to test the validity of some of our assumptions concerning the conceptual schema which implied in the inner-city system of non-technical geometric naming.

Lexical Preference and Invariance Task

While the Two Person Communication Game and the Forced Differentiation Task indicated that our inner-city subjects, by and large, did not use a stable, precise, well differentiated geometric vocabulary in their spontaneous naming of geometric forms, these studies left in abeyance the question of the degree to which these subjects would be "willing" or "able" to utilize such a vocabulary if one were made available to them.

Specifically, we were interested here in two questions: (1) Given a choice between precise and imprecise names for standard geometric forms which would our inner-city group most frequently prefer, and (2) Given the opportunity to use the same names for different rotations of the same geometric forms, would our inner-city subjects then exhibit the kind of stability of symbol-referent relationship which they seemed to lack in their spontaneous naming.

General Method

Each subject was given a test booklet containing two rotational variants of each of 10 geometrically distinct figures. Thus there were 20 figures, in all. A single figure appeared at the top of each page. Below each figure was a list of 10 names--some precise, some vague, and some manifestly incorrect. The task for the subject was to circle the number before that name which he felt "best described" the given figure, for him. The 20 figures are shown on the following page.

Two forms of this test were constructed: On one, Form A, the choices were derived from the technical geometric vocabulary; on the other, Form B, choices were derived from the archetypal inner-city non-technical geometric vocabulary constructed from subjects' responses on the Forced Differentiation Task. For each test form, two sets of names were constructed, one to be used with the three-sided figures, the other, to be used with the four-sided figures (see p. 42 below). Each figure was accompanied by a different permutation of the appropriate set of nine geometric alternative. The tenth item in each list was always "none of these is good", followed by a blank in which the subject could substitute any name he wished rather than choosing those alternatives which were given. (As we shall see below, this optional alternative proved to provide some of our most interesting data, in a way in which we would never have anticipated.) A typical page from the test booklet is shown below.

Finally, in assembling the test booklets, 3- and 4-sided figures appeared alternately, so that a figure and its rotational variant never followed one another.

Subjects were tested individually, as part of a more extensive testing session in which the Two Person Communication Game and the Forced Differentiation Task preceeded the present task, in that order.

Subjects.- Subjects were juniors and seniors at Detroit's Northern H. S., a predominantly Negro inner-city school. Fourteen of these subjects received Form A and 14 received Form B.

Results

The most interesting results arose from a comparison of our subjects' responses to the two different forms of this test, and provided a major insight into the inner-city conceptualization of these forms. Two aspects of these results are particularly interesting.

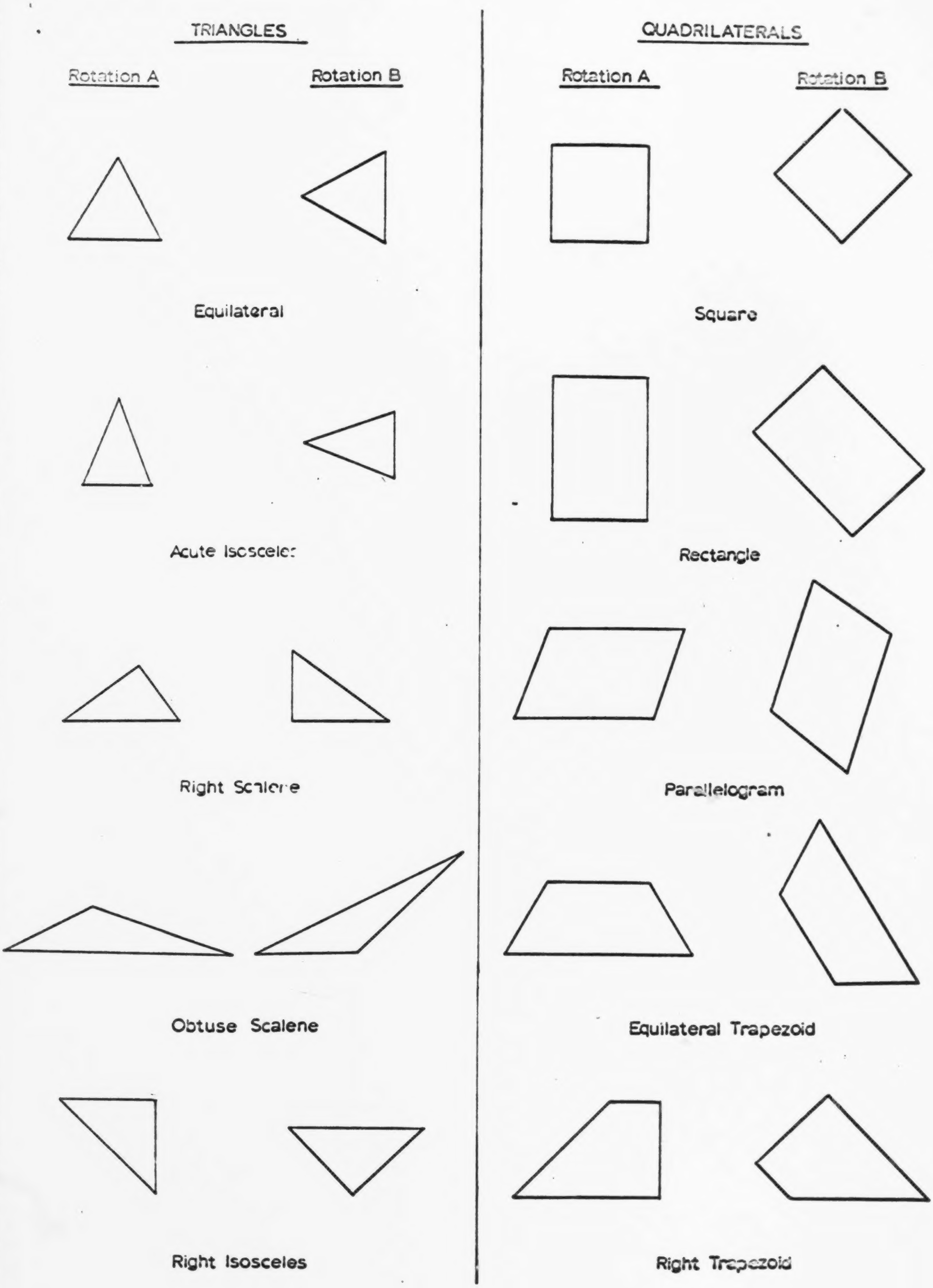
TRIANGLES
Rotation A
Rotation B
Equilateral
Acute Isosceles
Right Scalene
Obtuse Scalene
Right Isosceles
QUADRILATERALS
Rotation A
Rotation B
Square
Rectangle
Parallelogram
Equilateral Trapezoid
Right Trapezoid

Fig. 6. Forms for the Lexical Preference and Rotational Invariance Task.

Form A: Technical Geometric Names

3-Sided Figures

straight 3-sided figure
isosceles triangle
triangle
scalene triangle
rectangle
obtuse triangle
right triangle
crooked 3-sided figure
equilateral triangle
none of these is good

4-Sided Figures

straight 4-sided figure
square
quadrilateral
rectangle
triangle
trapezoid
parallelogram
crooked 4-sided figure
rhombus
none of these is good

Form B: Technical Geometric Names

sqaure-cornered triangle
pure triangle
crooked 3-sided figure
straight 3-sided figure
triangle with 2 sides equal
triangle with 3 sides equal
3-sided figure
cut-off square
triangle with a corner larger
  than a square-cornered
none of these is good

long square
pure square
crooked 4-sided figure
straight 4-sided figure
long slanted square
pure slanted square
4-sided figure
cut-off triangle

cut-off square
none of these is good

(1) Write-in responses.- A sizeable proportion of response to both forms indicated that "none of these is good" (38 of 280 responses, or 13.6% on Form A, and 71 of 280, or 25.3% on Form B). On Form A only 13 of these 38 choices (34.2%) were accompanied by write-in alternatives, and 12 of these 13 were contributed by a single subject. On Form B, in contrast, 51 of the 71 choices (71.8%) of "none of these" were accompanied by write-in alternatives--and these were contributed relatively uniformly by 9 of the 14 subjects.

The write-ins on Form B were particularly striking since they indicated how closely our hypothetical system of inner-city naming approximated that used by the subjects' themselves: i.e., virtually all of the write-in responses on Form B were "corrections" or "refinements" of the nontechnical vocabulary alternatives which we made available--all were within the same linguistic-conceptual frame of reference as that which we employed in constructing the non-technical list in the first place. For example, for the rectangle, we made available the non-technical choice *long square*. A typical subject who rejected this alternative and chose alternative 10, "none of these is good", wrote-in instead "*vertical long square, definition of just plain long square could be interpreted wrongly, such as*"--(here the subject draws in a rectangle in its horizontal orientation).

The contrast between the frequency of write-ins in the Form A and Form B seems to us explainable in terms of the kind of set which is established for these subjects by these two different lexical orientations. There is reason to believe, on the basis of other data from this study, that these subjects, by and large, responded to the technical geometric vocabulary primarily as "nonsense"--hence tended to assign these names to the figures in a more or less "random" fashion. Because the set itself was toward a "nonsensical" interpretation of the names, the subject himself, while rejecting the given alternatives, could arrive at no better suggestion, within the same frame of reference--i.e., the "nonsensical" one. In other words, this frame of reference did not "stimulate" any "creative" or "associative" ideas in his mind, since the given vocabulary was, itself, functionally "dead" for him. With the non-technical vocabulary, on the other hand, exactly the opposite may be presumed to have occurred--i.e., this vocabulary "spoke directly to" the subject, in terms which he understood and could react in a meaningful and creative way. The fact that he did react in this way is indicated by the critical attitude which he assumed toward the given alternatives, and his facility in correcting, improving, modifying, etc. these alternatives which were given to him.

These results, we believe, therefore provide some empirical confirmation that the non-technical geometric schema which we derived from our Forced Differentiation Task does, to a significant respect, approximate the conceptual schema which is manifest in the inner-city non-technical geometric vocabulary.

(2) Stability vs. lability of the symbol referent relationship.- The second question which was of interest here was the degree to which subjects on each form chose the same name for the two rotations

of a given figure, regardless of what particular name was chosen. The difference between the two forms in this respect was, once again, quite striking: On Form A, 35 of 140 pairs of responses (25.0%) showed such stability, while of Form B only 17 of 140 pairs (12.1%) did so.[8] Whereas on Form A, 35% of the subjects chose the same name for both rotations of the square, and 29% chose the same name for both rotations of the rectangle, on Form B no subject chose the same name for both rotations of either figure. In summary, then, these results seem to indicate that the closer we approximate the actual language of our inner-city group, the more labile that language appears to be.

This interpretation is consistent with our previous conclusion: viz., that for our inner-city group, the technical vocabulary is, by and large "dead"--devoid of "sense" or "significance". To the extent that this is the case, the technical vocabulary, for our inner-city group, insofar as they are forced (by the task) to employ this vocabulary, arouses no subtleties of distinction, suggests no alternative modes of formulation, provides no lee-way to account for those subtle distinctions which so dominate the spontaneous inner-city vocabulary, itself. Thus, the "invariance" which appears when the inner-city group is forced to employ the technical vocabulary seems to us to represent, not so much a recognition of the identity of geometric forms over rotational transformations (although this ability must certainly be present), as a lack of adequate means, within this lexical frame of reference, for representing those perceptual distinctions which are still felt to be important by our subjects. In this sense, these are pseudogeneric names, indicative not so much of an acceptance of the universality of the geometric forms underlying the various rotations, as of what Werner refers to as a "global" concept, on a par with the child's referring to all men as "daddy", or to cows, horses, cats, dogs, etc. as "doggies". That this may be the case is indicated by the fact that when these subjects were presented with a lexical frame of reference (Form B) which both suggests and lends itself to the linguistic expression of such subtleties, our subjects grasped this opportunity "with a vengeance", drawing many more subtle rotational distinctions than even we had built into the lexicon itself.

Plan for Future Studies

This present line of investigation, while already quite provocative, is still in mid-stream. Certain critical questions with regard to our inner-city subjects still remain to be answered: (1) How would a College control group perform on Form B (one has already been tested on Form A?) (2) Given the inner-city non-technical geometric vocabulary, would or could our inner-city subjects exhibit greater stability of symbol-referent relationship if they were specifically directed to note the invariance of formal geometric properties over rotational transformations of each figure? (3) What role does formal geometric training play in this task? Is it the case, for example, that our inner-city subject exhibit a high degree of lability on this task because they are, by and large, unfamiliar with formal geometric conceptualizations? Or is it the case, on the other hand, that most of our inner-city subjects fail to comprehend geometric concepts (even when they have had courses in geometry) because the linguistico-conceptual framework which they bring into such courses does not readily lend itself to the intuitive grasp of the geometric concepts being conveyed? (4) If the latter is the case, at what age or developmental stage, do inner-city and middle-class children begin to assume these specialized forms of language and thinking? Questions such as these will be the subject of our future studies in this area.

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[8] In absolute terms, these figures must be evaluated against the performance of a College control group which showed such invariance for 171 of 280 pairs, or 61.0%.

References

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Berko, J. & Brown, R. Psycholinguistic research methods. In P. H. Mussen (ed.), Handbook of Research Methods in Child Psychology. New York: Wiley, 1960.

Bernstein, Basil. Social class, speech systems and psycho-therapy. Educational Research. 1961, 3, 1963.

Bernstein, Basil. Social class, linguistic codes and grammatical elements. Language & Speech. 5, p. 221.

Bernstein, Basil. Linguistic codes hesitation and phenomena and intelligence. Language & Speech, 1962, 5, 31-46

Bernstein, Basil. A socio-linguistic approach to social learning. Social Science Survey. (Ed. I. Gould) Pelican Book, 1965.

Buhler, K. Sprachtheorie. Jena: Fisher, 1934. Summarized in H. Werner and B. Kaplan, Symbol Formation. New York: Wiley, 1963, pp. 52-66.

Carroll, J. B. Process and content in psycholinguistics. In R. Glaser, et al. (eds.), Current trends in the description and analysis of behavior. Pittsburg: 1958, pp. 175-200.

Carroll, J. B. Words, meanings, and concepts. Hav. Ed. Rev., 1964, 34, 178-200.

Carroll, J. B. Language and thought. New Jersey: Prentice-Hall, 1964.

Cassirer, E. An essay on man. New Haven: Yale U., 1944.

Cassirer, E. Language and myth. New York: Harper, 1946.

Cassirer, E. Structuralism in modern linguistics. Word, 1945, 1, 99-120.

Cassirer, E. The problem of knowledge. New Haven: Yale U., 1940.

Cassirer, E. Philosophy of symbolic forms: III. The phenomenology of knowledge. New Haven: Yale U., 1952.

Cassirer, E. Substance and function and Einstein's theory of relativity. Chicago: Open Court, 1923.

Cazden, C. B. Subcultural differences in child language: an interdisceplinary review. Merrill-Palmer Quart., 1966, 12, 185-219.

Curme, G. O. & Kurath, H. A grammar of the English language. Boston: Heath, 1931.

Entwhistle, W. J. Aspects of language. London: Faber, 1964.

Ervin, Sloan M. & Miller, W. R. Language development. In Stevenson & J. Kagan (eds.), Child psychology. Chicago: U. of Chicago, 1963, pp. 108-143.

Feffer, M. H. The cognitive implications of role-taken behavior. J. Personality, 1959, 27, 152-168.

Feffer, M. H. & Gourevitch, V. Cognitive aspects of role-taking in children. J. Personality, 1960, 28, 383-396.

Fishman, J. A. A systematization of the Whaorfian hypothesis. Behav. Sci., 1960, 5.

Flavell, J. H. Role taking and communication skills in children. Young children, 1966, 21.

Fry, C. L. Training children to communicate to listeners. Child devel. 1966, 37.

Furth, H. G. Thinking without language. New York: Free Press, 1966.

Heider, F. K. & Heider, G. M. A comparison of sentence structure of deaf and hearing children. Psychol. mono., 1940, 52.

Hunt, K. W. Grammatical structures written at three grade levels. Champaign, Ill.: Nat. Council Teach. Engl., 1965.

*Huth, A. Die Nebensatze in der Kindersprache. Z. Padag. Psychol., 1919, 20, 163-183.

Hymes, D. (ed.) Language in culture and society. New York: Harper & Row, 1964.

Krauss, R. M. & Glucksberg, S. Some aspects of verbal communication in children. Paper read at symposium on "approaches to interpersonal communication", APA, Chicago, 1965.

Lawton, Dennis, Social class differences in language development a study of some samples of written work. Language and Speech. 1963, 6, 120-143.

Lawton, Dennis Social class differences in group discussions. Language & Speech. 1964, 7, 182-204.

*Minkus, W. & Stern, W. Die Bindewort Erganzung. 19th Beih. angew. Psychol., 2nd Ed., 1923, 37-73.

Oakes, M. E. Children's explanations of natural phenomena. New York: Columbia U., 1947.

Piaget, J. Language and thought in the child. New York: Harcourt, Brace, 1926.

Piaget, J. Judgment and reasoning in the child. New York: Harcourt, Brace, 1926.

Piaget, J. *The child's conception of physical causality*. London: Kagan, Paul, 1930.

Piaget, J. *The psychology of intelligence*. New York: Harcourt, Brace, 1950.

Piaget, J. *The child's conception of number*. New York: Humanities, 1952.

Piaget, J. *The origins of intelligence in children*. New York: IUP. 1952.

Piaget, J. *Logic and psychology*. New York: Basic Books, 1957.

Piaget, J., Inhelder, B., & Szeminski, A. *The child's conception of geometry*. New York: Harper Row, 1960.

Sapir, E. *Selected writings*. Berkeley: U. Calif. Press, 1949.

Schnall, M. Spatio-temporal integration in progressively changing visual patterns. In S. Wapner & B. Kaplan (Eds.), *Heinz Werner 1890-1964*. Worcester, Mass.: Clark U. Press, 1966, pp. 63-70.

Sigel, I., Anderson, L. & Shapiro, H. Categorization behavior of lower- and middle-class Negro pre-school children: Deficiencies in dealing with representations of familiar objects. *J. Negro Educ.*, Summer, 1966.

Sigel, I. & McBane, B. Cognitive competence and level of symbolization among 5 year old children. In J. Helmuth (ed.), *The disadvantaged child*, vol. I. Seattle, Wash.: Special Child Publications, in press.

Sledd, J. Coordination (faulty) and subordination (upside-down). In H. B. Allen (ed.), *Applied English Linguistics*. New York: Appleton-Century-crofts, 1958, pp. 354-362.

*Stern, W. & Stern, C. *Die Kindersprache*. 3rd Ed., Leipzig:Barth, 1928.

*Stern, W. & Stern, C. *Monographien uber die seelishe Entwicklung des Kindes: I. Die Kindersprache*. Leipzig: Barth, 1928.

Vygotsky, L. S. *Thought and language*. New Haven: MIT, 1962.

Werner, H. *Comparative psychology of mental development*. New York: IUP, 1948.

Werner, H. The concept of development from a comparative and organismic point of view. In D. B. Harris (ed.), *The concept of development*. Minneapolis: U. of Minn., 1958.

Werner, H. & Kaplan, E. The acquisition of word meanings: A developmental study. *Monogr. Soc. Res. Child Developm.*, 1952.15, 190-200.

Werner, H. & Kaplan, B. Symbol formation. New York: Wiley, 1963.

Werner, H. & Kaplan, B. The developmental approach to cognition: Its relevance to the psychological interpretation of anthropological and ethnolinguistic data. Amer. Anthrop., 1956, 58, 866-880.

Whitehead, A. N. Modes of thought. New York: McMillan, 1938.

Whitehead, A. N. Process and reality. New York: McMillan, 1929.

Whorf, B. L. Language, thought, and reality. (J. B. Carroll, (ed)., New York: Wiley, 1956.

APPENDIX B

Procedures for the Analysis of Stories at the Simple Sentence Level

This scoring manual is written for use with the scoring sheet which appears on the following page. The purpose of this analysis is to determine (1) the distinctive characteristics and formal adequacy of the simple sentences used in the spontaneous speech of subjects, and (2) the type, function, and frequency of the connectives used to conjoin these simple sentences into more complex sentences.

This particular analysis represents one level of the more general system of categories proposed for a complete analysis of spontaneous speech presented elsewhere.

The scoring sheet, in particular, and the entire method, in general, is designed to facilitate a quantitative comparison between developmentally and/or culturally different groups, in spontaneous speech elicited under standard experimental conditions (i.e., the telling of a story to the picture arrangement cartoons of the WISC or WAIS).

PROCEDURE FOR ANALYSIS OF STORIES:

SIMPLE SENTENCE LEVEL

This analysis is exhaustive in that every utterance of the subject is analyzed from the time the examiner first asks him to tell a story. The only exception is repetition of responses by the subject upon the request of the examiner. These repetitions are not recorded.

I. Division into Scoring Units

The first task is to divide the speech into discrete units. The basic unit of analysis is a simple sentence consisting of subject and verb (and object where called for).

Ex: *A man threw a ball.*

Such a unit may be imbedded in a compound or complex sentence and must be isolated as a discrete unit.

Ex: *A man is walking and a dog is following him.*

This sentence is analyzed into two units, with the connective "and" forming part of the second unit:

First unit: Item 1) *A man is walking*
Second unit: Item 2) *And a dog is following him*

The connective "and" is set out in the column headed Clause Connect. Examples of other connectives which precede units and which will be placed in this column are: well, because, but, so, and then, that, which, who, when, once, once upon a time, where. It should be noted that where the utterance "uh" precedes a "unit," it is also set out in this column.

In order to constitute a separate unit, two of the three parts of speech (subject, verb or object) must be present.

Ex: *He jumped up and got the chicken.*

First unit: *He jumped up*
Second unit: *and/ (he) got the chicken*

Here, the second unit is isolated because of the presence of both the verb (got) and object (the chicken). By contrast, the following example contains only a double verb:

Ex: *He ran and jumped.*

Unit: *He ran and jumped*

This is scored as one unit because the second verb lacks both a subject and object (i.e., only one of the three elements is present.

Ex: *The dog who was following them ate the chicken.*

Analysis: Item 1) *The dog (...2...) ate the chicken.*
Item 2) *...who was following them...*

In connection with Item 2, the three dots which precede and follow the unit indicate that it is an acceptable sentence, since it was correct in the sentence from which it was taken (even though it may not appear to be well formed in isolation).

A sentence fragment is considered a unit.

Ex: *about a dog. He has a bone.*

This is scored as two units:

Item 1) *about a dog*
Item 2) *He has a bone*

A new unit is considered to have begun whenever the subject begins speaking after the examiner has said something.

Ex: *the policeman, and the boy crying.*

This is scored as one unit. "The boy crying" is regarded as an adjectival phrase (the crying boy).

Ex: *the policeman, the boy playing with matches*

This is scored as two units.

Item 1) *the policeman*
Item 2) *the boy playing with matches*

The difference in the scoring of the two preceding examples is the presence of the object (with matches) in the latter example which is the reason for scoring it as a separate unit.

If the phrase "the boy crying" is part of a complex sentence, the analysis is as follows:

Ex: *The boy crying cause he made the fire*

First unit: *the boy crying*
Second unit: *cause/ he made the fire*

The first unit is treated as a fragment of the sentence, "the boy is crying", rather than as an adjectival phrase "the crying boy". Another example follows:

Ex: *The policeman and then the boy crying*

First unit: *the policeman*
Second unit: *and then/ the boy crying*

The second unit is an abbreviation of "the boy is crying" by virtue of the connective "and then".

II. Eliciting Conditions

Where the unit is a response to a question of the examiner, the type of question should be indicated under the column Eliciting Conditions. The explicitness of the question is indicated in the following way.

0) E says "uh-huh", "okay", "right".
1) What is the story? Tell me the story. Go on. Any more? Anything else?
2) What's happening? What else is happening?
3) What's going on in the pictures? What does it show in the pictures? What else does it show? What happened in the pictures?
4) What are they doing? Where?
5) Who (or what) are they?
6) Why? How do you know?
7) And then? And then what happened?

III. Meta-narrative

The first decision after the unit has been recorded is whether the item is part of the story, or constitutes dialogue with the examiner. If the item is a question such as "Shall I start now?", it is considered to be extraneous to the story and is scored Metanarrative. Responses to questions of the examiner may also be Meta-narrative:

Ex: *E: Do you know why he is crying?*
S: Yes, because he started the house on fire.

The response "yes" is Meta-narrative. Other examples of Meta-narrative are: I think; I mean, etc. If an item is considered to be Meta-narrative, the only place it will be scored is in the column Meta-narrative.

IV. Idioms

If the unit contains expressions which, although not strictly correct English, are acceptable usage in certain regions, the unit is scored Idiom.

Ex: *The dog was walking ahind of the man.*

The expression "ahind of" is considered to be an idiom. If an item is scored Idiom, this is the only place it will be scored.

V. Well-formed Units

The first decision for units considered to be part of the story is whether or not they constitute well-formed sentences in the

English language. A unit is considered to be well-formed if: 1) the word order is correct· 2) there are no necessary parts of speech omitted: 3) all the words have the appropriate meaning for the position in which they are used; 4) there are no redundant parts of speech and 5) all appropriate inflections have been used. If a unit meets these requirements, it is scored under the column Well-formed. The only additional decision concerning well-formed units is whether or not they constitute an example of Nominalization. Omissions which consist of words "understood" from E's question are not considered to be necessary parts of speech and so the unit is scored well-formed. However, the column "question" is also checked.

VI. Nominalization

Where the unit names items in the pictures, the number of items listed is scored in the column #Items under the heading Nominalization. The number of and's connecting these items is marked under #And's. And's which are in the Clause Connectors Column are not included.

Ex: *There is a boy, a girl, and a fireman and another boy.*

Scoring:	*# Items*	*# And's*
	4	*2*

The above example is considered to be a well-formed unit, since there are no inversions of word order, no word omissions, substitutions or redundancies, and all appropriate inflections have been made.

VII. Poorly-formed Units

In this analysis, there are three basic categories of errors which result in a poorly-formed unit: 1) an inversion of word order: 2) errors at the word level; 3) errors at the inflectional level. Errors at the work and inflectional levels are further analyzed into both type (omission, substitution or redundancy) and form (subject, verb, plural markings for nouns, etc.)

1) Word Order - If a unit is poorly-formed because of an inversion of word order, the column Word Order will be scored. If the only error is word order the only additional column which could be scored is Nominalization.

2) Errors at the Word Level - If a unit is poorly formed because of errors at the word level, three columns are scored for every error: one for type of error, one for form of error, and one for reason for error.

i) Omission - If a necessary part of speech is omitted, the column Omission under the heading Word is checked. Necessary parts of speech are considered to be:

a) Subject - Example: ___ *is lighting the match.*

b) Verb - Example: *He ___ away.*

c) Verb Part - Example: *He ___ putting it out.* This includes infinitive, example: *The boy tried ___ run.*

d) Object (with a transitive verb) - Example: *The man hit ___.*

e) Article - Example: *He threw it out ___ window.*

f) Preposition - Example: *The boy took it ___ the table.*

g) Conjunction - Example: *They show a little boy (and) ___ a mother.*

h) Clause - Example: E: *Why is he crying?* S: *Because ___________.*

i) Indeterminate - Where the nature of the omission cannot be determined.

ii) Substitution - Where the wrong word is used for a part of speech, the column Substitution is scored, and the column indicating the erroneous part of speech is marked as follows:

a) Verb - Example: *He took it from falling off the table.*

b) Article - Example: *Give him a milk.*

c) Preposition - Example: *He took me at the circus.*

d) Other - Score this column for an error other than the preceding.

iii) Redundancy - Where a part of speech is unnecessarily inserted, the column Redundancy is scored, and the column indicating the pleonastic part of speech as follows:

a) Subject - Example: *The boy he lit a match.*

b) Verb - Example: *He'll might get burned.*

c) Object - Example: *He dropped it the chicken.*

d) Article - Example: *He likes the Bobby.*

e) Preposition - Example: *He took it off from there.*

f) Other - Score this column for an error other than the preceding.

g) Where the redundancy is in the connector, if the units themselves are well-formed, score in the Well-formed column. In this case, the poor form is in the connector, not the unit.

Ex: *He took the fried chicken and then and then the man was surprised.*

VIII. Reason for Poor Form at the Word Level

A column indicating the reason for the poor form is always marked.

Omissions

A) Implicit Depiction - Where the omissions are due to a substitution of gestures for language, this column is scored.

Ex: *a boy.*

This unit is interpreted as a fragmented form of "there is a boy". The scoring is: Word Omission: Subject, Verb: Imp. Dep.

B) Correction - Where a unit contains a correction, score this column.

Ex: *The boy wanted ... the man wanted a banana.*

First unit: *The boy wanted*
Second unit: *The man wanted a banana.*

The scoring is, Unit 1) Word Omission: Object: Correction. Unit 2) is scored Well-formed.

C) Repetition - This column is scored only when the redundancy consists of repetition of a word.

Ex: *He he ran away.*

The scoring is Word Redundancy: Subject: Repetition, for type, form and reason for error respectively.

E) Indeterminate - Where the reason for the poor form is none of the above, the column Indeterminate is scored. As stated above, a column indicating the reason for word omission is always marked. In addition, those word redundancy errors which consist of exact repetition are always scored under Repetition.

3) Errors at the Inflectional Level - If a unit is poorly-formed because of an inflectional error, two columns are scored: one for the type of error, and one for the form of the error.

i) Omission - Where a word should have been inflected but was not, this column is scored, together with the column indicating the locus of the omission as follows:

a) Plural Marker - Example: *two fireman*

b) Verb Form - Examples: *He want(ed) it yesterday.*
He was walk(ing).

c) Possessive - Example: *That's hes match.*

d) Other - Score this column for any other inflectional omission, example: *You play nice.*

ii) Substitution - Where the wrong inflection was made, score this column, and the column indicating the locus as follows:

a) Plural Marker - Example: *two firemans.*

b) Verb Form - Example: *He growed up fast.* Where the verb does not agree with the subject this column is scored. Examples: *Here come the fire engine. Here comes the fire engines.*

c) Possessive - Example: *That's mys.*

d) Other - Score this column for any other inflectional substitution, example: *Him runs fast.*

iii) Redundancy - Where a double inflection was made, score this column, and one of the following columns:

a) Plural Marker - Example: *two firemens.* The addition of an "s" which is not intended as a plural marker is included here, example: *His name is Rogers.*

b) Verb Form - Example: *She splashted herself.* Other examples: *He ranned away; they camed. The police putted out the fire.*

c) Possessive - Example: *That's mines.*

d) Other - Any form doubly inflected which is not indicated above is scored here. Example: *Do it rightly.*

IX. Multiple Errors

Where a unit contains more than one type of error, each type of error, together with its related form is scored.

Ex: *The boy want* ___ ___ *go at the movies.*

The scoring for the three errors is: 1) Word Omission: Verb part: Indeterminate (for the omission of "to" in the infinitive "to go"); 2) Word Substitution: Preposition (for the preposition "at" for "to"); 3) Inflectional Omission: Verb (for the failure to inflect the verb "want").